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SOME HISTORICAL ASPECTS OF PLANT TAXONOMY¹

M. L. FERNALD

I have decided to speak to you today upon Some Historical Aspects of Plant Taxonomy, not because I am a historian but because of the imperative need of clearer understanding of our dependence on historical factors in proper interpretation of our floras and their component genera and species. The good old subject, natural history, in its very name seemed to imply something of this sort; but, as the late William Morton Wheeler so often lamented, natural history is out of fashion. I wholeheartedly subscribe to his opinion, for it so happens that I hold the title, so long made famous by Asa Gray, of Fisher Professor of Natural History. When, in the first half of the last century, that professorship (originally the Massachusetts Professorship of Natural History, founded in 1805) was established, the field of its incumbent was defined as including the organization of a botanic garden, the teaching of botany and entomology (with botany mentioned first) and the collecting of "all specimens in mineralogy . . . and after arranging them he shall deposit them in the Cabinet of Mineralogy belonging to the Corporation of Harvard College."

That was natural history indeed. Forthwith many of our colleges had professors of Natural History, who taught botany

¹ Vice-Presidential address delivered before Section G, American Association for the Advancement of Science, and affiliated Societies, at Dallas, Texas, December 30, 1941. In the absence of Professor Fernald, read by Professor Samuel W. Geiser of Southern Methodist University, Dallas. Publication in RHODORA as additional pages made possible through a gift from Mr. BAYARD LONG.

and zoölogy, with geology and mineralogy on the side. But the term and its full implication soon got lost; "biology" elbowed them out and more and more in too many of our institutions biology has become animal physiology and anatomy, with a partial recognition of plant anatomy and physiology and a smug indifference to taxonomy and the other interests which formerly constituted natural history. Section G of the American Association and its young daughter, the Botanical Society of America, as well as its numerous smaller granddaughters, have honorable titles, distinguished histories and sufficiently extensive fields of endeavor. May they maintain their autonomy and never become mere stepchildren of "biology". And what of the museums of Natural History? Many of them, still clinging to the old term natural history, have unblushingly divorced botany from their field of activity, natural history to them, like biology to many others, meaning merely the study of animals; and, absurdly enough, the term Natural History to some people, who have never seen over the boundary-fence which so often isolates the so-called humanities, seems to be thought of as a branch of human history. As a Professor of Natural History I regularly receive announcements and circulars from numerous historical organizations; and within three years I have been invited to prepare and present at an international conference, sponsored by our State Department in Washington, an original contribution in the field of political history.

But to come to my main theme. Plant taxonomy or systematic botany is coming back. More and more those whose botanical training ignored or overlooked this fundamental field are asking: "What is this plant; how can I find out what it is?"; and are giving concrete evidence of leaning, at least, on systematic botany. With this recent awakening to the importance and the great human interest of knowing at least by name and by superficial characteristics the common plants about us, the student is bound to ask: "Why do plants have Greek, Latin or latinized names? Why aren't the English names good enough?" He then will soon ask: "Why do you taxonomists often use different names for the same plant? Why, for instance, do Britton and Small call the bleeding-heart *Bicuculla*, while others call it *Dicentra*; why do the first two botanists call the tick-trefoils

Meibomia, others calling them *Desmodium*?" And above all, "Why do so many taxonomists disguise what they mean in describing new species by using 'dead' Latin; isn't living English the official language in the United States?" These are healthy questions. The answers to them should be clear.

One of the elementary interests of man has always been the classification in his own way and the naming of the natural objects around him. The peoples of all races have such classifications and names. It was natural, then, that among the earliest classical writers some should have turned their attention to plants and animals. It follows, therefore, that many of the names still current in botany date back to Pliny (23-79 A. D.), Dioscorides (first century A. D.) or Theophrastus (370-285 B. C.). Their viewpoint was largely that which after the Middle Ages become known as the "doctrine of signatures". These old names of plants, consequently, often reflect a supposed resemblance to some part of the human body, man, of course, being the animal most familiar to man. Several such names, unfortunately, cannot be literally translated in mixed society and my distinguished predecessor, Asa Gray, appending brief derivations of generic names in his *Manual*, coined for such names the naïve explanation "meaning recondite"! What would more certainly lead the true inquirer to his classical dictionaries?

Gray lived in the Victorian era. Nevertheless, in my student-days, listening to lectures on the fine arts by a professor who got his ideas chiefly from John Ruskin, I, as a devout young botanist, was forced to listen with tolerance to scathing remarks, by one who knew little about them, regarding the indecencies of plant-names, just as if nothing shocking is ever tolerated as art. Some years later, when a proposition was before the Harvard Faculty of Arts and Sciences to require all undergraduates to take at least one course in each of the major fields of learning (omitting botany and zoölogy), I urged the importance for everyone of some understanding of the principles of biology. My plea was promptly but unsuccessfully met by a professor of romance literature, he urging that biology is an immodest subject, as Ruskin had already shown.

We are gathered as workers and students in this vast field of botany and at the risk of shocking the finer feelings of the ghosts

of Ruskin, his former American disciple and the specialist on romance literatures, I propose to start with ancient names of plants having to do with generation of the human species and thence to refer briefly to the historic or traditional backgrounds of names which we all know. One of the most famous aphrodisiacs of all time has been the Mediterranean genus *Mandragora*, the mandrake. Its fame was so general that it found mention in the Old Testament. From the volumes of literature upon its supposed properties I quote a mild passage of the 16th century: "The roote is long, thick, divided . . . into two or three parts, resembling the legs of a man . . . There have been many ridiculous tales brought up of this plant, whether of olde wives or some runnagate surgeons or physickmongers, I know not (a title bad enough for them!) . . . They adde further, that it is never or verie seldome to be founde growing naturally but under a gallows, where the matter that hath fallen from the dead bodie hath given it the shape of a man; with many other such doltish dreames. They fable further and affirm, that he who would take up a plant thereof must tie a dogge thereunto to pull it up, which will give a great shriek at the digging up; otherwise if a man should do it, he should certainly die in short space after: besides many fables of loving matters, too full of scurrilitie to set forth in print, which I forbeare to speake of." The 16th century herbalist, however, was not content to stop there; he promptly added: "He that would know more hereof may read that chapter of doctor *Turner* his book concerning this matter."

Many museums of zoölogy or of medical science and anatomy display to an intelligent or unintelligent public a model of an infant in the mother's womb, with head and feet near together. We are, therefore, inevitably reminded of that large genus of plants of tropical and temperate regions, the birthworts, *Aristolochia*. This generic name, from two words meaning *best delivery*, came down at least from Pliny. It is nearly 2000 years old (probably older since of Greek origin and presumably borrowed by Pliny) and it was given because the Mediterranean species has the large calyx bent back, with summit and base together. The plant was, consequently, supposed to have been indicated by the Creator as an aid in child-birth. Neither the name nor its origin is now considered shocking; to Ruskin they were beyond the

pale. They are really most interesting, as opening our eyes to a curious philosophy of the past, which was the basis of much medical practice. The modern drug-store has on its shelf mandrake pills, although it is toward 3000 years since the plant gained its initial reputation.

Other familiar old generic names reflect the supposed generative (I mean no pun) powers of the plant; while still others reflect its supposed origin. The Mediterranean and oriental *Adonis* of the *Ranunculaceae* is credited with having sprung from the blood of the youthful lover of Venus, who, torn to shreds by a wild boar set upon him by the jealous Mars, was changed by Venus into the herb which annually springs into bloom. Similarly *Anemone*, with many red-flowered species in Asia Minor, commemorates Na'man, the Semitic equivalent of Adonis.

Still others of the ancient generic names were based upon resemblances to human organs, to diseased conditions or, in some cases, to familiar animals or their obvious characteristics. To this group belong *Chelidonium*, *Dracontium*, *Paronychia*, *Saxifraga* and *Juglans*. *Chelidonium*, swallow-wort, is a quick-growing small poppy with saffron-orange latex. According to Aristotle (384–322 B. C.) and other ancient scholars, the mother-swallows gather this herb and strengthen the sight of their young by painting the eyes with the orange juice. If you doubt the accuracy of Aristotle, Theophrastus and Pliny, examine a swallow's eye. You will there find the orange or yellow ring! *Dracontium*, for which our green dragon, *Arisaema Dracontium*, was named, has a long spadix projecting from the spathe, like the tongue of a dragon or serpent; a piece of dragonroot carried in the pocket was thought to keep away venomous beasts. *Paronychia* has dry chaffy scales and bracts like dry fingernails; it was, therefore, the reputed cure for the disease of the nails known as paronychia or, in English, whitlow, whence the colloquial name, whitlow-wort. *Saxifraga granulata* and related species bear small pebble-like grains and bulblets about the base, other species having them in the inflorescence. Consequently, by the inevitable ancient philosophy, they were a cure for calculi: "the root boiled in wine and drunken, breaketh the stone and driveth it forth." *Juglans* (the walnut), a name used by Cicero and others, is a contraction of *Jovis glans*, the nut of Jove, be-

cause of its supposed great power, as clearly indicated by the corrugated and folded flesh of the nut, resembling the human brain, in curing weakness of the brain and insanity. In these modern times the connotation of the word "nut" has become reversed. We should be cautious, nevertheless, about jeering at those modern faddists who live chiefly on nuts.

After the classical period and through the Middle Ages the study of botany suffered along with other learning; but with the Renaissance and perfection of printing learned doctors, surgeons and apothecaries, in addition to priests, monks and some country gentlemen, entered the field, and the sumptuous volumes, often beautifully illustrated and printed and larger than the traditional family bible, attest their zeal. To a great extent these students of the 16th and 17th centuries derived their matter from the ancient writers, but some of them showed marked originality. In these brief comments we must pass those centuries, until the publication in 1700 of the great work of Tournefort, *Institutiones rei herbariae*. In this monumental work, Tournefort, assembling from past students great volumes of condensed information, attempted for the first time on any such scale definitions of all recognized genera of plants, with concise and clear diagnoses, bibliographic references and drawings illustrating the diagnostic characters of the genera as understood by him. Tournefort, unfortunately, followed the universal polynomial nomenclature of his time, with each species designated by a long descriptive phrase. With the rapid advance in the science such long phrases became cumbersome and it was a great contribution of Linnaeus, that he reduced these descriptive phrases of the species to a single selected specific name, this, combined with the generic name, giving us the binomial, now in general use. Linnaeus accepted many of the genera as defined by Tournefort, citing the latter's diagnoses and figures. In interpreting such genera, taken over by Linnaeus directly from Tournefort, it is necessary to go back to the latter author. In other cases Linnaeus derived his generic names and their diagnoses from predecessors other than Tournefort and, of course, he coined many names himself and gave for them original diagnoses.

Since, by general agreement at international congresses, the nomenclature of plants begins with Linnaeus in 1753, the plant

taxonomist wisely stops in his backward search for interpretations with that date, except in cases where Linnaeus based his genera and species primarily on the work of earlier authors. This is fortunate, for in too many cases the older authors left no adequate specimens by which their descriptions and names can be checked; even the names of Linnaeus, whose great herbarium belongs to the Linnean Society of London, are frequently subject to different interpretations. Of that more later.

Returning to the origins of the names. The authors down to and including Tournefort and Linnaeus naturally accepted many generic names, such as *Calla*, *Iris*, *Myrica*, *Cannabis*, *Morus*, *Ulmus*, *Celtis* and *Cercis*, from classical writers, others from botanists of the 16th and 17th centuries, and inevitably coined many themselves. As interesting as any, taken over from Pliny and Virgil and perpetuated to our present time, is *Cornus*. In English we call it dogwood, as if it has some association with dogs; but the derivation of our English name seems to have been directly through the Latin generic one. *Cornus*, the ancient name, from *cornu*, a horn, referred to the hardness of the wood, a European species having long been used for skewers by butchers and for daggers and other sharp implements, whence the colloquial names in some English provinces, skewerwood and *dagwood*, the latter coming from the Old English *dagge*, a dagger or sharp, pointed object. *Cornus* and *dagwood* are, then, apparently closely related in meaning, and only by an erroneous etymology did dogwood become established as the English name of *Cornus*. It would be as pedantic to urge the abandonment of "dogwood" for *Cornus* as to insist that *Erythronium* shall not be called "dog-tooth violet." Those purists who insist that this name should be abandoned because *Erythronium* is not really a violet apparently lack human souls; they are merely tedious bodies and intellects. In ancient usage the term "violet" was applied to many showy spring-flowers, whether or not they belonged to the genus *Viola*. One of the ancient "violets" of the Mediterranean region and central Europe is *Erythronium Dens-canis*, *Viola Dens-canis* of the ancients, literally dog-tooth violet, because of the white and pointed ovoid bulb suggesting the eye-tooth of a dog.

All that I have thus far said concerns the folk-origin or the

ancient philosophic background of classical names of plants. To the extreme literalist many such names, based upon demonstrably erroneous assumptions, are misleading; to those who still cherish Santa Claus they are full of literary and historic connotation. At any rate the usually very mechanical international rules of botanical nomenclature insist on the retention of such old names as were maintained by Linnaeus in 1753. Coming back to consideration of the genera and species taken over from earlier botanists or first defined by Linnaeus, we find that he had a keen appreciation of the historic or mythological bases of names and their frequent folk-origin. To be sure he coined some which are descriptive, *Eriophorum* (bearing cotton or wool), *Alopecurus* (a fox's tail) and *Celastrus* (commonly evergreen); but when compared with such latter-day names as *Cynoglossopsis*, *Abromeitiella*, *Pseudopostoa*, *Haageocactus*, *Asta* of the *Cruciferae* (in Yankee pronunciation not distinguishable from the venerable name *Aster* in the *Compositae*), and *Saintpauliopsis*, even the more matter-of-fact names of Linnaeus become poetry.

Linnaeus wrote at great length upon the philosophy of botany and he had a strong contempt for malformed and hybrid names. His own (except a few barbaric ones taken over from non-Latin tongues) are models, and the keen imagination of the master was constantly at work. As a student, tramping from southern Sweden northward into Lapland, he became acquainted, on June 11, 1732, with the flesh-colored flowers of *Andromeda polifolia* and his youthful enthusiasm found exuberant expression. In his journal he wrote: "As I contemplated it I could not help thinking of Andromeda as described by the poets; and the more I meditated upon their descriptions, the more applicable they seemed to the little plant before me . . . Hence, as this plant forms a new genus, I have chosen for it the name of *Andromeda*."¹ The genus *Andromeda*, as understood by Linnaeus in 1753, was highly complex; and, forthwith, such scholarly botanists as David Don, Konrad Moench and Richard Salisbury, segregating it into its elements, followed the lead of Linnaeus and gave mythological names to the separated genera. That was as it should be; the anticlimax was American. The great manipulator of transcontinental railroads, the late Edward H. Harriman,

¹ *Lachesis Lapponica*, trans. J. E. Smith, i. 188, 189 (1811).

ordered by his physician to break away from his nerve-wrecking New York office, organized a yachting cruise to Alaskan waters, his invited party including botanists and other naturalists. Mr. Harriman keenly appreciated the refined beauty of the little moss-like shrub with delicate white flowers, the *Andromeda hypnoides* of Linnaeus, already separated as *Cassiope hypnoides* (L.) D. Don. Immediately, therefore, there was added a name in the group and those who maintain all the generic names proposed for species of the original *Andromeda* of 1753 must recite some of them as follows: *Andromeda*, *Cassandra* or *Chamaedaphne*, *Cassiope*, *Leucothöë*, *Phyllodoce*, *Pieris* and—*Harrimanella*. What taste!

One other case is of more strictly North American interest. I refer to Leatherwood, Moosewood or Wicopy, *Dirca palustris* L., the small tree-like shrub of rich woodlands of Atlantic North America. It is closely related to the Old World *Daphne*, but by Linnaeus was separated as the genus *Dirca*. The original material known to Linnaeus was collected by John Clayton along streams of interior Virginia: "Ad ripas fluminis R [o]lanok dicta, aliorumque fluviorum prope montes".¹ Linnaeus, separating it from *Daphne*, consequently, with his fine feeling for propriety, took his cue from Clayton's statement of the habitat and named it for Dirca or Dirce, wife of Lycus, who, after her brutal murder, changed into the fabulous fountain Dirce. Linnaeus, however, was a better student of the classics than of English, for he rendered the English-American colloquial names: "*Anglis* Leatervoud s[ive] Mousevoud".²

Linnaeus delighted to honor in his generic names the outstanding and sometimes more humble botanists of his own and preceding centuries. In his *Critica Botanica* he stated that such "names formed to preserve the memory of a Botanist who has deserved well of the science I retain as a religious duty . . . I would sooner root out all generic names which do not in themselves express the essential character of the genus than one taken from the name of a Botanist who has deserved well of the science";³ but he did not, like some recent botanists, issue a

¹ Gronovius, Fl. Virgin. 155 (1739).

² L. Amoën. Acad. iii. 13 (1756).

³ Translation of Sir Arthur Hort, The "*Critica Botanica*" of Linnaeus, 61, 62. Ray Society, London, 1938.

joint report with reciprocal compliments, with first a species named by no. 1 for no. 2, then one named by no. 2 for no. 1 and so on through the volume. Most fortunately, the newspaper reporter's idea that taxonomists regularly name plants and animals for themselves is rarely so nearly exemplified. Linnaeus's own characterization of the genus named for him was as follows: "*Linnaea* was named by the celebrated Gronovius and is a plant of Lapland, lowly, insignificant, disregarded, flowering but for a brief space—from Linnaeus who resembles it."¹

In naming genera for others Linnaeus often exhibited the lively fancy so apparent in his other generic names. Two examples of these must suffice; these I have selected as belonging to genera familiar in Texas. "*Commelina* has flowers with three petals, two of which are showy, while the third is not conspicuous." Therefore, Linnaeus named the genus for three Dutch students of early date, "the two botanists called [Jan and Kasper] Commelin: for the third died before accomplishing anything in Botany."²

Everyone in the warmer parts of the Americas knows *Tillandsia*. It is closely covered with appressed scales which caused Linnaeus wrongly to infer that it sheds and has no use for water. With this false inference in mind he gave the generic name *Tillandsia*. It seems that a student, afterward a professor at Abo, crossed the Gulf of Bothnia by boat, to attend the university at Stockholm. He was so painfully seasick that thereafter he regularly made the journey, five times the shortest distance, overland around the head of the Gulf. Furthermore, in the Scandinavian fashion of his day, he assumed the surname Tillands, which signifies "by land"³. Who but Linnaeus would have grasped such a straw in seeking to name a new genus?

Occasionally, however, Linnaeus was misled, especially through the errors of others. The insistent genius of the English in anglicizing French words is proverbial. In my own wanderings in Newfoundland and southern Labrador this has been everywhere apparent. Bonne Espérance and Blanc Sablon of Cartier and other French discoverers of the region are "Bonny Spearens" and "Nancy Belong"; Griguet is "Cricket", and Le Quirpon is

¹ After Hort.

² After Hort.

³ Linnaeus, Praelect. Ord. Nat. 291 (1792).

"Karpoon". So with plant-names in various parts of the world. French explorers in the West Indies called one of the trees *bois fidèle*. By the English this was interpreted as fiddle-wood (of which no one ever made a fiddle); and Linnaeus fell into the trap, coining for it the correctly latinized Greek equivalent, *Citharexylum* (fiddle-wood).

In his descriptive specific names Linnaeus was particularly happy; they have been constant models for later botanists. In his geographic adjectives applied to American plants he was less happy. In continental North America he recognized six principal areas: Canada, Pennsylvania, Maryland, Virginia, Carolina and Mexico; these he seems to have drawn by lot and forthwith applied them. His *Potentilla pensylvanica* came from Hudson Bay; his *Berberis canadensis* from the Alleghenies. And several American plants, early carried to the Mediterranean by Portuguese and Spanish explorers, were assumed to have come from the East or Southeast, while the geographic sources of others were hopelessly tangled. The commonest and endemic temperate North American milkweed is *Asclepias syriaca* L.; the Atlantic North American *Conioselinum* is *C. chinense* (L.) BSP. These, after all, merely demonstrate that the great founder of modern taxonomy was human and that he had the proverbial European understanding of American geography.

There is not time further to follow the origins of our plant-names. Nor can I tax your patience by taking up the masterly works of hundreds of founders of taxonomy. The pioneer work of Clusius, Bauhin, Morison, Ray, Plumier, Dillenius, Burmann, Gronovius, Scheuchzer, Haller, Hill, Gmelin and their contemporaries tempts the chronicler of progress in the science, as do the wonderful forward steps of Lamarck, Robert Brown, de Jussieu, the DeCandolles, Jacquin, Willdenow, Koch, Kunth, Schlechtendal, Agardh, Fries, von Martius, Ledebour, Endlicher, Alexander Braun, Eichler, Schimper, Lindley, Decaisne, Bentham, the Hookers, Gray, Boissier, Regel, Hackel, Warming, Engler, Wettstein and a host of equally great or hardly lesser masters. Contemplation of the tremendous volume of fundamental work in taxonomy done before the period of electric lights, typewriters, short-hand, automobiles, radio and movies by such profound scholars as Lamarck, Alphonse DeCandolle,

von Martius, Ledebour, Boissier, Bentham & Hooker and countless others should bring a blush at least of modesty to many of us modern workers who so obviously seek to swell the weak personal bibliography by trivial and needlessly multiplied titles.

All these we must pass; proper discussion and appreciation of their work would require many volumes. In the remaining moments, moreover, I shall restrict my examples largely to cases in the only flora I know, that of temperate eastern North America; and I shall try not to wander too far from the elementary questions propounded in my opening paragraphs.

"Why do plants have Greek, Latin or latinized names? Why aren't the English names good enough?" From the days of Pliny to those of the most modern of taxonomists the use of Latin or Greek names has been the universal practice, the great taxonomic works of Linnaeus, Lamarek, Willdenow, the DeCandolles and Bentham & Hooker upon worldwide floras, of Robert Brown on Australia, of Schlechtendal on Alaska, of von Martius on Brazil, of Gmelin or of Ledebour on Russian Siberia, and their hundreds of contemporaries and successors have been written wholly or with at least the names and technical descriptions in Latin. By common consent Latin for two milleniums has been the chosen language of scholarship; at any rate, scholars, seeking the best, have found much of it, first in Greek, later in Latin. Consequently the international rules of botanical nomenclature wisely lay down the fundamental principle (Art. 7) that "Scientific names of all groups are usually taken from Latin or Greek. When taken from any language other than Latin, or formed in an arbitrary manner, they are treated as if they were Latin. Latin terminations should be used so far as possible for new names." In general, taxonomic botanists have respected this principle, laid down by Linnaeus; but, especially in the earlier post-Linnean period, they sometimes dug up such barbarities as *Lablab*; on the other hand certain aboriginal American names, taken over for genera, like *Mayaca*, *Sassafras*, *Catalpa* and *Sequoia*, offend no one. If, as some in non-descriptive sciences so short-sightedly urge, the taxonomist, in clinging to the Latin or latinized names is non-progressive, what would they substitute? Surely a colloquial name like "cat-tail" or its equivalent in other languages is not widely intelligible. In many

parts of the United States and Canada it means *Typha*; but in Britain alone "cat-tail" has been colloquially used for aments of *Corylus* or of *Juglans*, or for inflorescences or plants in *Phleum*, *Equisetum*, *Scirpus*, *Echium*, *Eriophorum*, *Amaranthus* and *Hippuris*. Those who attended the International Botanical Congress at Ithaca, in 1926, will remember the session when the chairman of the excursion committee announced a trip where the party would pass an extensive "cat-tail swamp." Immediately the hundred Old World delegates looked questioningly at their American colleagues, until the Chairman of the session, the late Professor Ostenfeld, properly instructed, wrote on the blackboard: "Cat-tail = *Typha*." Then, but only then, all was clear. A system of vernacular names is not safe in exact taxonomy.

"Why do taxonomists often use different names for the same plants?" In the earlier days of modern taxonomy most of the detailed studies were made at universities or museums of competing European nations. Naturalists of diverse interest accompanied the great exploring or naval expeditions or were sent out on botanizing missions from France, Britain, Denmark, Sweden, Holland or Russia; and the plants brought back were studied and, when thought to be new, described by taxonomists of the national institutions or by those supported by the patrons of science. With limited personal contact between the earlier workers, it was inevitable that there was duplication of names or that different names were given to similar plants; and when the Americas entered the field of descriptive botany their remoteness from workers in Vienna, Berlin, Paris, Leiden, Copenhagen and even London was a perpetual handicap.

The bleeding-hearts were generally recognized as a genus during the first half of the 19th century and in the thirty years from 1824 to 1853 no less than eleven generic names were assigned to them by workers at different institutions: *Dicentra* by Bernhardt at Erfurt in 1833, *Cucullaria* by Endlicher at Vienna in 1839, *Bicucullaria* by de Jussieu at Paris in 1840; and other names by workers in centers as remote as Lexington, Kentucky, and St. Petersburg (now Leningrad) in Russia. *Dicentra* was extensively taken up and had long been preferred, when it was discovered that one of the somewhat irregular authors of names

(so irregular that some botanists have seriously proposed legislation to outlaw his names), Adanson, had proposed for the genus in 1763 the name *Bikukulla*. This has absolute priority and those botanists, who for some years opposed the international agreement to conserve the better-known names which lack technical priority of publication, picked up Adanson's name (altering it in a manner inconsistent with their professed insistence on strict priority, to *Bicuculla*). Many such instances occur, and the leading taxonomists of the world, recognizing that strict application of the principle of priority of publication in generic nomenclature would produce needless confusion, have very wisely adopted the principle of conserving such much-used and long-established names as *nomina generica conservanda*, with hearty approval of all but the most adamant. *Dicentra* is thus conserved; so is *Desmodium* over *Meibomia*. Were these and others not so conserved we should lose many names which have long since become established in taxonomic, morphological, horticultural and pharmaceutical literature: *Spirogyra*, *Vaucheria*, *Fucus*, *Selaginella*, *Podocarpus*, *Agathis*, *Sequoia*, *Welwitschia*, *Glyceria*, *Spiranthes*, *Carya*, *Calycanthus*, *Wisteria*, *Ailanthus*, *Vernonia*, *Liatris* and *Zinnia*, along with many hundreds of others. How would the traditional botanical laboratories and teachers of morphology respond if, following the strict principle of priority, they were told to discard the name *Spirogyra* and take up for it *Conjugata*, to throw out good old standard *Fucus* in favor of *Virsoides*, that *Selaginella* must be called either *Selaginoides* or *Lycopodioides* (published at the same date), that *Zamia* is *Palmafilix*, that *Sequoia* must become obsolete and we must call it *Steinhauera*? For some years loud outcries arose from a minute minority against *nomina conservanda*. Today such protests are scarcely heard.

The principle underlying *nomina conservanda* is sound; but the detection of long-familiar names which, unless conserved, must fall, is never finished. Obscure old books and papers, previously overlooked, come to light, like many of those of Rafinesque who, during his lifetime, was so generally erratic that his contemporaries ignored or destroyed his publications. It is authoritatively stated that a saintly and profound leader in American botany of a century ago, receiving isotypes of many of Rafinesque's pro-

posed genera and species and copies of his innumerable publications, conscientiously consigned them to a bonfire as the work of the Devil. Who today would not make great sacrifices to see authentic specimens of Rafinesque's species? When, therefore, rare, obscure or overlooked old works come to light, upsets are likely to occur. Since the original list of *nomina conservanda* hundreds of other names have been suggested for conservation. These include *Setaria*, *Rhynchospora*, *Loranthus*, *Nama*, *Helychrysum* and many scores more which it would be a pity to lose. Everyone discovering a good old name in danger of exclusion will do a real service by communicating it to the Secretary of the International Commission on such names.¹

Furthermore, the human equation comes in. Different points of view and different experiences lead to divergent conclusions. The sections or subgenera of one author are the genera of others. The genus *Pyrola* of a more conservative group of botanists is to some others a group of genera. The cytologically similar and freely hybridizing *Sorbus* and *Aronia* are to some, who lay more emphasis on habital characters, satisfactory genera. To others they are congeneric and to others only subgenera of the inclusive genus *Pyrus*. These are honest differences of judgment and no legislation will solve them.

As to the use by all considerate taxonomists of Latin in publishing new diagnoses, a brief consideration will show that any other course would be selfishly inconsiderate; incidentally such publication would be invalidated by the international rules. Latin having been for more than 2000 years the language of scholarship in all western civilization, it is inevitable that no real student of plants and their proper identification and classification can possibly get beyond the mere threshold until he makes himself at least a slight master of the language of his subject and of his long line of outstanding predecessors. He may, like many of us, be forced to overcome the deficiency of school- and college-training, and his Latin may be very unpolished and unclassical; but by imitating such masters as Haller, Linnaeus, Schlechtendal, Blume, DeCandolle or Bentham he can make himself understood. Of course some absurdities result in the descriptions by those whose Latin is as weak as their taxonomy, as, for instance,

i
errata

¹ Miss M. L. GREEN at the Royal Botanic Gardens, Kew.

in the case of one prolific author who joyfully strung together long phrases, all in the nominative singular. Nevertheless we can guess what was intended. It has been the practice, especially among European students, to append to their diagnoses, not their own names, but the Latin "mihi" or "nobis", thus modestly indicating that they are the authors. When, however, we find the editor of a two-volume government-supported work seriously including Nobis as a significant botanical writer it is difficult to restrain a smile: "*Nobis*. Naturalista francés, que trabajó con Richard en la clasificación de las plantas cubanas de Sagra"¹.

If we did not have occasional bits of such unconscious humor our work might become monotonous. When, however, one witnesses the undisguised belittling of a foundation-training in Latin, as well as of any real understanding of plant taxonomy, which pervades too many of the so-called and rather assertive recent laboratories of "biology", he can only pray that scholarship or the appreciation of it may not wholly disappear from botany. I am informed that students of morphology and taxonomy are regularly encouraged to gain such insight as they can into plant physiology. How often do present-day physiologists enroll in courses in taxonomy? If all botanists sympathetically grounded themselves in the elements of the major areas of their vastly inclusive broad field, such symptomatic incidents as the following would rarely occur. A young taxonomist and morphologist, desiring to have some insight into plant physiology, was reducing to ash (for chemical analysis) a flowering plant. After thus disposing of the root, stem and leaves he asked the instructor: "Shall I burn the inflorescence?" The prompt reply was: "Inflorescence? What are you giving us? I know all about efflorescence and fluorescence, but you've pulled a new one on me—'Inflorescence'!"

The latter incident and numerous others like it indicate that some groups of biologists have not materially broadened their outlook since the famous *faux pas* of 1902. At one of the relatively youthful American universities plant taxonomy has always been denounced. This may be because the original head of the department of botany there had once made a superficial

¹ Estudios Sobre la Flora de Puerto Rico, ed. 2: 49 (1936).—Pub. Fed. Emergency Relief Administration.

plunge at that exacting field without full appreciation of its dependence on precision. At any rate the attitude of the institution was clearly expressed by one of its more outspoken botanists as follows. After elsewhere explaining that he is one of "those of broader viewpoint," he wrote: "The world of morphologists, physiologists and ecologists has borne with" the sinning taxonomist "patiently and long . . . a little more and the sinning taxonomist will be 'cast out into the outer darkness where there shall be wailing and gnashing of teeth'"¹ This critic, who, in spite of his prejudices, later became a beloved friend of many of us, has unfortunately died; I am not informed whether he is now obliged to associate with taxonomists. But to come to the *faux pas* referred to. A thesis published from the botanical laboratory of the aforementioned university seemed, on the surface, to break down the reputed characters separating the *Saxifragaceae* (with 2 carpels, etc.) from the *Rosaceae*, because the student of professors who shunned taxonomy had found 2 carpels in "*Spiraea japonica*". Very soon, however, Professor Alfred Rehder² pointed out the fallacy; the erroneous deduction was based, not on *Spiraea japonica* of the *Rosaceae*, but upon *Astilbe japonica* Gray, a long-recognized and quite typical member of the *Saxifragaceae*. Ho, hum!

To such wholly satisfied workers as these the use of Latin in new diagnoses seems pedantic, unprogressive and far from their conception of "biology". To those of us who have to spend weary hours checking the descriptions of new species by taxonomists the world over, it is a blessing. If the peoples writing a language of non-Latin origin all insisted upon using only their mother-tongues we should never get to a common meeting-ground. When, however, the active taxonomists of Japan, China, Russia, Czechoslovakia, Italy, Germany, Scandinavia, England, Argentina, and the United States all forego their personal convenience and conscientiously put into understandable (though often halting and imperfect) Latin their new diagnoses, we can all interpret what is meant. Otherwise there would be perpetual darkness. Modern scientific Latin is a living language and an invaluable implement.³

¹ Am. Nat. xlii, 270, 271 (1908).

² Rehder, Bot. Gaz. xxxiv, 246 (1902).

³ In this connection we may take justifiable pride in the fact that the conservative

I now come to one of the difficult but inescapable and time-consuming duties of the exact taxonomist. In these days no careful worker ever describes a new genus, species, variety or form without designating a special individual from among those he has studied to stand as the TYPE or standard for future students. He also should, and usually does, state in what herbarium it is deposited. But until comparatively recent times phytophographers did not think in terms of TYPES or single selected standard specimens; they were concerned with the whole specific or generic concept and included within it all the material they had studied, without specially designating one as outstandingly representative. When DeCandolle, Engelmann or Gray had before him dozens or scores of specimens which he put together as one species they were all considered as typical. If they had only one specimen their interpreter in later years may regard himself as unusually fortunate. Attempts to formulate as a dogmatic rule procedure in determining which of several or many specimens shall be considered the type lead to constant error. One cannot wholly project himself into the minds of past workers, but the close student of a group may select the particular specimen which seems best to represent the original author's concept. In this, however, only the close student of the group should be trusted; merely mechanical selection is too doubtful. I may illustrate by a personal experience. In 1894, assigned to identify a large collection made by the late C. V. Piper in Washington State, I detected a plant which seemed to me specifically different from *Lathyrus polyphyllus* of Nuttall. Piper's plant had few large purple flowers, few leaflets and small stipules and, after studying its relationship, I published it as *L. pauciflorus*. Picking out

workers in American botany urged before the International Congress at Cambridge University in 1930 the retention of a requirement of Latin diagnoses for new plants. In the Proposals by the Sub-Committee on Nomenclature, appointed by the Imperial Botanical Conference and published in 1929 as the "Proposals by British Botanists", an attempt was made to weaken this requirement, the British Sub-Committee saying of their proposition (Art. 41, p. 40) "The requirement of a Latin diagnosis . . . is omitted". Subsequently, at the opening of the Congress, finding that the Japanese, Russians, Czechs, Scandinavians, most Americans and others were strongly for the retention of the Latin requirement, the British withdrew without argument their proposition. The joke was this: the dear old *London Times* editorially complimented the always scholarly British on winning their hard fight for the retention of the Latin diagnoses in the face of overwhelming opposition from the Americans and other crude peoples. So far as I could learn, this insinuation by the *Times* was never corrected.

from the herbarium two older sheets of specimens which I then identified with Piper's, I cited these in chronological order, Piper's more recent material coming last. Some years later a western student pointed out that the first specimen cited in the series was not conspecific with the others but that, since it was the first cited, it must be taken as the type. Such an interpretation, of course, was unjustified, because the description, when checked, was so evidently based upon the Piper material and so clearly excluded the plant erroneously placed with it. In this case the author of the species was able to make the decision. In case of authors of past centuries that is not possible.

When Linnaeus based a new species upon a single specimen or a single citation, the interpretation of his species is simple enough. Trouble begins, however, when he had associated with his own material descriptions of other and earlier authors. A single recently discussed case may make clear the problems we must face in selecting types for such Linnean species or genera.

The genus *Heuchera* of the *Saxifragaceae* started in 1737 almost simultaneously in the *Genera Plantarum* of Linnaeus and in his monumental *Hortus Cliffortianus*. In the former work he described the genus but in the latter he gave no description, merely citing his *Genera*, stating that it was North American and that it was named for Johann Heucher of Wittenberg; and appending references to descriptions of earlier authors which he thought to belong to his *Heuchera*. Here was the full treatment in *Hortus Cliffortianus*:

HEUCHERA. g. pl [*Genera Plantarum*]. 196

1. HEUCHERA

Cortusa americana, flore squalide purpureo. *Herm. par. p.* 131. *descript.*

Cortusa americana, floribus herbidis. *Herm. par. t.* 131.

Sanicula s. *Cortusa americana* spicata, floribus squalide purpureis. *Pluk. alm.* 332. t. 58. f. 3.

Mitella americana, flore squalide purpureo villosa. *Boerh. lugdb.* I. p. 208. *descr. floris.*

Primula veris montana laciniata americana, flore squalide purpureo. *Herm. lugdb.* 506.

Crescit in America, forte septentrionali, cum hyemes nostras bene ferat.

Dixi hoc genus plantarum a Joh. Heuchero, ex Horto Wittenbergensi claro, ejusque supplementis, in quibus varia curiosa lectuque digna exhibuit.

Since our nomenclature begins with the publication of *Species Plantarum* of Linnaeus in 1753 we next turn to that work, in which the binomial of the type of the genus appears, as *Heuchera americana* L.

americana. I. HEUCHERA. *Hort. cliff.* 82. *Gron. virg.* 29. *Roy. lugdb.* 437.
Cortusa americana, flore squalide purpureo. *Herm. parad.*
 131, t. 131.
Sanicula s. *Cortusa americana* spicata, floribus squalide pur-
 pureis. *Pluk. alm.* 332. t. 58. f. 3.
Habitat in Virginia. ♀

In the treatment of 1753 no description was given, but Linnaeus referred immediately back to his own *Hortus Cliffortianus*, in which a reference was given to the slightly earlier *Genera Plantarum*. One of the references to Hermann was omitted but a new one (to Gronovius) was added; altogether there are eight descriptions given or cited.

What is the type of *Heuchera americana*? If, in preparing his *Species Plantarum* of 1753, Linnaeus had had in his own herbarium a specimen so named by him and matching his description (published in 1737) most of us would consider the question settled. In this particular case it is not so easily settled, for the late Dr. B. Daydon Jackson, for years a close student of Linnaeus, has clearly indicated that Linnaeus had no such specimen. We must, therefore, get out all eight volumes in addition to *Species Plantarum* and carefully compare them. To me, at least, the plants of the Clifford Garden, which were the basis of the wonderful *Hortus Cliffortianus* of Linnaeus, are next in significance, because they were actually before and described by that author. The plants he did not personally work with are of secondary importance. Fortunately, the Clifford Herbarium, preserved at the British Museum, contains the specimen. A photograph of it strongly suggests *Heuchera hispida* Pursh, rather than the plant passing as *H. americana*. If by some it be insisted that the specific name *americana* was taken over by Linnaeus from earlier botanists and that the plants of Hermann or that of Plukenet or of Boerhaave, as bearing that epithet, should be accepted, we are worse off still. Plukenet's figure is so conventionalized that it means little; Hermann's plate and some of the old descriptions lead directly to *H. villosa* Michx. Until, after the war, we can secure good photographs or make discriminating comparisons with the old specimens upon which Plukenet, Gronovius and others based their accounts we cannot be sure what they had. If, however, we stop, as I should do, with the material which Linnaeus himself described and ignore the miscellaneous and contradictory references, something clear will result.

What it is cannot positively be asserted until the Clifford plant is actually examined for details not brought out in a photograph.

This single and not very complicated case, except that it is upsetting to some of our cherished convictions, well illustrates the difficulties of the exact taxonomist, who must seek the solution of fundamental questions in the ancient collections of the Old World and in the literature of two or three centuries past. The eight citations above noted as essential in getting to the real identity of the Linnean species involved are only a part of them. Hermann and Boerhaave added others and more modern students have made their guesses and have published discussions until, in an attempt to elucidate a single basic fact it is often necessary to have open simultaneously about one no less than 20 or 30 volumes, some of them large folios and several of them rare. In the experimental and anatomical fields this is usually unnecessary. In those fields the books of the past, except as curiosities or as occasional landmarks, are relatively unessential; to the taxonomist who would trace his problems to final solution they are indispensable. The illustration I have given is a very simple one. Many similar ones require the checking and intensive study of twice as many volumes.

This intrinsic difference between the scholarly demands and historic background in taxonomic work (except that which glibly assumes that some one else will settle these troublesome questions) and the needs in the morphological and physiological fields is a serious handicap to many workers. Without the fundamental literature at hand they, obviously, can go only part-way; there they are forced to stop. Furthermore, in too many universities and museums, which really possess a good portion of the necessary literature, workers in taxonomy are perpetually handicapped through the short-sighted policy of administrative officers who, ambitious to make a great show of their library, insist on keeping in centralized stacks many of the books needed by special workers in remote corners of the institution. Too often these special workers, who alone have need of the old books, can secure those which are necessary for their precise work only after an amount of red-tape and delay which becomes deadening. I could tell you of at least one elaborate museum where taxonomic workers, instead of going through the great difficulties necessary

in securing from the distant library the essential books which they need, prefer to write to others hundreds of miles away, to look up, in a library maintained for the workers, points which are salted away but not readily accessible at their own institutions. Unless universities and museums make the essential books readily available to their technical staffs, who alone can use them, they can expect only indifferent results from their workers. In the fields where books are merely consulted and a few notes taken from them, centralization may be advantageous. In a field constantly dependent upon ready and simultaneous access to scores of volumes in settling a single point the essential books should be right at hand.

Another most important prerequisite to final results in taxonomy is access to the types or to accurate photographs of the types. Many thousands of species of the United States and Canada and similar numbers from the West Indies and South America were first described at European establishments. Similarly, thousands of species of the western half of North America were originally described in the Eastern States, as were many from the Pacific Islands and from eastern Asia. In the latter cases the types are readily available; in the former they are often scattered or unknown. On the whole, however, a remarkable proportion of the American plants described by pre-Linnean students, such as Plukenet, Catesby, Morison or Gronovius, are preserved. Several herbaria studied by Linnaeus are extant; these are now stored in vaults underground. The herbarium which partly formed the basis of Thomas Walter's *Flora Caroliniana* (1788) belongs to the British Museum. The tremendous herbarium of André Michaux, the basis of his two-volume *Flora Boreali-Americana* (1803), is kept apart from other collections at Paris. Other fundamental collections by the score are in European herbaria. Properly to interpret the species described it is necessary to know the original specimens. Photographs of many thousands of them have been made; other thousands remain to be photographed; but in many cases photographs alone do not give all that is needed. Minute details of diagnostic importance must be personally examined by the specialist. These studies, unfortunately, must await the new epoch we all are hoping for. Some of us, who have yearned to settle many points by personal

inspection of many types, will never do so, but they will eventually be properly studied and the absorbing and fundamental problems in the proper identification of our species will be settled.

Other historic factors in the proper study of taxonomy could be enumerated, for instance the very important work in tracing the exact routes of early explorers and collectors, such as is being so thoroughly prosecuted by Texan and other southwestern botanists. I must not, however, venture now into that large field, for I should soon tax your patience. The main points I have tried to emphasize are the historic and traditional background of plant taxonomy and plant-names; the dependence of exact taxonomy on the students and specimens of the past; the imperative need, if students in this field are to progress, of their having readily at hand the significant literature, dating back to 1700; and the need of still further studying the original specimens or types, from which our species have been described. This inevitable dependence on the work of the earlier botanists and their specimens is an intrinsic element in plant taxonomy; in the morphological and physiological fields the past and its literature are of relatively slight importance. If I have thus been able to make clear these fundamental differences of stress, I shall have done something to correct a misconception of taxonomy which in recent years has been too much fostered by those unfamiliar with its dependence on the past.

THE STATUS AND DISTRIBUTION OF SOME CYPERACEAE IN NORTH AND SOUTH AMERICA

HUGH O'NEILL

CYPERUS, SUBGENUS *MARISCUS**

The name *Mariscus* in Pliny's *Historia Naturalis*¹ refers to a species of rush (*Juncus*). In 1742 Haller² used the word to describe a genus of plants which embraced a species subsequently called *Schoenus Mariscus* by Linné.³ Zinn⁴ defined the genus in

* [For a monographic treatment of *Mariscus* refer to Horvat, Sr. M. Liguori, A Revision of the Subgenus *Mariscus* Found in the United States. Contr. Biol. Lab. Cath. Univ. America. No. 33. 1941.]

¹ 21: 69. A. D. 77.

² Enum. Helvetiae 251.

³ Sp. Pl. ed. 1. 42.

⁴ Cat. Pl. Hort. Gott. 79.

1757 as including Haller's *Mariscus* and *Schoenus Mariscus* L. However, a year previously Patrick Browne⁵ published a West Indian species (of *Mariscus* Zinn) under the name *Cladium effusum*, thus introducing a new generic name. He failed to characterize this as a genus; however, Crantz⁶ described it in 1766. In 1788 the name *Mariscus* was used by Gaertner⁷ to designate a group of plants not related to *Cladium* but to *Cyperus*.

Since the *International Rules*⁸ validate a genus originally based on a single new species without a separate generic description, the name *Cladium* is recognized by reason of its priority and *Mariscus* Zinn becomes a synonym.

Gaertner's *Mariscus* was further restricted to mean the genus (or subgenus of *Cyperus* as now understood) by Vahl (1806).⁹ Since that time it has been treated as either a subgenus or a genus although the latter use is now invalidated since the name had already been used by Zinn for a group synonymous with *Cladium* before Gaertner took up the name. Fernald¹⁰ refers to it as "closely allied to and only unsatisfactorily separated from *Cyperus*." Robert Brown, Presl, Nees ab Esenbeck, Steudel, Clarke (i. e., in his later views) and Chermeson maintained it as a separate genus. Rottboell, Boeckeler, Bentham and Hooker, Suringar, Pax, Kükenthal and Fernald have preferred to leave it within the limits of *Cyperus*.

The three style-branches (stigmas) and trigonous achenes differentiate the subgenus *Mariscus* from 3 of its allied subgenera, i. e., *Juncellus*, *Pycreus*, and *Kyllinga*, all of which have two style-branches and lenticular achenes. The fact that the rhachilla does not break up into one-fruited joints distinguishes it from *Torulinium*, which subgenus exhibits that character in a marked degree. The decisive character that separates *Mariscus* from *Eucyperus* has been a much disputed point and still remains to be demonstrated.

Vahl¹¹ separated *Mariscus* from *Cyperus* only on the basis of its few-flowered ("subtriflorus") spikelets. In this respect he

⁵ Nat. Hist. Jamaica 114.

⁶ Inst. 362.

⁷ De fruct. 1: 12.

⁸ Art. 43.

⁹ Enum. Pl. 2: 372.

¹⁰ RHODORA. 25: 50. 1923.

¹¹ Op. cit. 372.

was followed by Robert Brown¹² who observed: "Habitus Cyperi, a quo differt solummodo spiculis paucifloris." It might be noted, however, that "paucifloris" meant for him "spicula 2-3-flora." Kunth,¹³ among others, pointed out the futility of attempting a separation based on that character: . . . "oft in derselben Art die Zahl der Blüthen variiren kann, so folgt hieraus natürlich, dass die Grenze zwischen jenen Gattungen eben so unbestimmt als willkürlich werden muss." Clarke¹⁴ confirmed Kunth's viewpoint: "The number of fertile flowers to the spikelet is of no use as a diagnostic character: in *Cyperus flavus* there are sometimes five or six nuts to the spikelet, though it is admittedly a typical *Mariscus*." Lestiboudois¹⁵ also maintained that there can be "spiculae multiflorae" in both *Cyperus* and *Mariscus*.

At one time Kunth tried to make the division between *Mariscus* and *Eucyperus* depend upon the fact that the achene in the former lay in a depression of the rhachilla ("in excavatione rhacheolae receptum"), surrounded by a well-developed and persistent wing. Later, he relegated that feature to the same category as that regarding the number of flowers¹⁶. "Der von mir früher (in *Nova gen. et species plant.* I. p. 212) der Gattung *Mariscus* beigelegte Charakter, wonach die Früchte in einer Vertiefung der *Rhacheola* liegen sollen, ist zwar vorhanden, findet sich aber gleichzeitig auch in mehreren Abtheilungen der Gattung *Cyperus*, nämlich in denen, welche ich *Papyri*, *glomerati*, *pennati* und *mariscoides* genannt habe."

Nees¹⁷ characterized *Mariscus* by the readily deciduous spikelets which disarticulate from the rhachis above the "squamis inferioribus" (i. e., the secondary prophyllum and bracteole): "Differt a Cypero spiculis a squamis inferioribus articulo solubilibus, rachi residua post lapsum spicularum quasi paleacea remanente."

Clarke¹⁸ accepted Nees's characterization and added an associated glume-character: "The subgenus of *Mariscus* includes

¹² *Prodromus* 218. 1810.

¹³ "Über die natürlichen Pflanzengruppen der Cyperaceen und Hypolytreen." *Physikal. Abh.* 8: 3.

¹⁴ "On the Indian Species of *Cyperus*." *Journ. Linn. Soc.* 21: 33. 1884.

¹⁵ *Essai sur la famille des cyperacées* 31. 1819.

¹⁶ *Op. cit.* 4.

¹⁷ "Synopsis generum Cyperacearum," *Linnaea* 9: 286. 1835.

¹⁸ *Op. cit.* 32, 33.

(for me) all those species . . . in which the glumes are permanent; or at all events do not fall from the spikelet before the spikelet has fallen from the rhachis . . . In all the numerous preceding species of *Pycneus*, *Juncellus* and *Eucyperus* the glumes fall from the rhachilla (while the rhachilla remains attached) by a clean-cut line separating the glume from its basal portion, which is decurrent down the rhachilla."

Another diagnostic point of *Mariscus* to which Clarke¹⁹ called attention is the presence of a papilliform disc on which the rhachilla is seated and from which it disarticulates leaving a smooth scar. He would have his meaning of "disc," which he thinks has differentiating value, distinguished from Boeckeler's meaning of the same term: "I hold that two very different things are included as discs by Boeckeler. In many species of *Cyperus* where the spikelet is at all oblique in its axis, in the dried state the rhachilla contracts very near the base *below* the lowest glume: here it seems to sit on a small cushion, but it is very firmly attached, and does not disarticulate at this point. This appearance (often only a result of drying) is not uncommon throughout the genus, as in *C. polystachyus*, where it is often prominent; and I estimate it as of no classificatory importance."

The persistence of glumes on a very readily deciduous rhachilla has been the distinguishing factor most widely used to separate the two subgenera. The condition of the papilliform disc has rarely been used. By means of the first character (persistence of glume) certain species are clearly referable to *Mariscus*.

| | | |
|-------------------------|-------------------------|---------------------------|
| <i>C. retrofractus</i> | <i>C. Nashii</i> | <i>C. Pringlei</i> |
| <i>C. hystricinus</i> | <i>C. globulosus</i> | <i>C. ligularis</i> |
| <i>C. dipsaciformis</i> | <i>C. flavus</i> | <i>C. thyrsiflorus</i> |
| <i>C. uniflorus</i> | <i>C. regiomontanus</i> | <i>C. lentiginosus</i> |
| <i>C. ovularis</i> | <i>C. Mutisii</i> | <i>C. refractus</i> |
| <i>C. retrorsus</i> | <i>C. asper</i> | <i>C. lancastrimensis</i> |
| | <i>C. tetragonus</i> | |

The following species, however, show characteristics both of *Mariscus* and *Eucyperus*; indeed, some of them show nearly all the characteristics of *Eucyperus*:

| | | |
|------------------------|-----------------------|------------------------|
| <i>C. Deamii</i> | <i>C. Martindalei</i> | <i>C. manimae</i> |
| <i>C. spectabilis</i> | <i>C. Houghtonii</i> | <i>C. cephalanthus</i> |
| <i>C. Schweinitzii</i> | <i>C. Wrightii</i> | <i>C. strigosus</i> |
| <i>C. Fendlerianus</i> | <i>C. Blodgettii</i> | <i>C. planifolius</i> |
| <i>C. filiculmis</i> | <i>C. Pollardi</i> | <i>C. Parishii</i> |
| <i>C. Grayii</i> | <i>C. fuliginosus</i> | |

¹⁹ *Ibid.*, 154.

Readily deciduous glumes, disarticulating along a straight line from a more or less persistent rhachilla are conspicuously evident in all the species of the second list, particularly in those of the *Laxiglumi* section of Kükenthal. But almost equally as readily deciduous are the rhachillas, which disarticulate either with none, some or all glumes persistent. The proper classification of these species, therefore, has always puzzled botanists.

Kükenthal²⁰ considers disarticulation of the spikelet found in typical *Mariscus* an advance over the more primitive type of non-disarticulating spikelet found in true *Eucyperus*. Species formerly regarded as *Eucyperus* by most botanists but showing even in a slight degree disarticulation of the spikelet are considered by him to be undergoing a stage of transition, approaching *Mariscus*; and he has placed them in that category, although they still show many characters of *Eucyperus*.

Apparently, there is not a single reliable character or set of characters available by which these two subgenera can be sharply distinguished from each other. Detailed histological and cytological studies along with genetic and ecological research may in the future yield more satisfactory results. It therefore seems ill-advised to maintain *Mariscus* as a genus when it is a very ill-defined even as a subgenus.

IS SECTION ARISTATI PROPERLY PLACED IN MARISCUS?

THE STATUS OF CYPERUS GRANITOPHILUS McVAUGH

In *Castanea* 2: 100-104. 1937, McVaugh described a plant which he considered a new species and which he thought closely related to *C. inflexus* Muhl. (i. e., *C. aristatus* Rottb. in this treatment). The following key shows additional features which may be used to distinguish McVaugh's plant:

- Spikelets in dense hemispheric heads; culms rigidly erect; glumes 1.0-2.0 mm. wide, widened at about the middle, 9-13-nerved; achene 0.5-0.8 mm. wide, cuneate-obovoid; stamens commonly 1 or 2 on the same plant; anthers 1.0 mm. long; filaments 2.5 mm. long; rhachilla 0.4-0.8 mm. wide. Apparently confined to soil resulting from the weathering of granite, from Georgia to North Carolina.....*C. granitophilus* McVaugh.
- Spikelets digitate in dense or loose heads; culms more or less flaccid; glumes 0.5-1.0 mm. wide, scarcely widened below the middle, 7-9-(very rarely 5 or 11) nerved; achene 0.3-0.5 mm. wide, oblong to oblong-obovoid; stamens 1 (very rarely 2); anthers 0.3-0.4 mm. long; filaments 1.5 mm. long; rhachilla 0.2-0.6 mm. wide.....*C. aristatus* Rottb.

²⁰ Engler, *Pflanzenr.* 4³⁰²: 35. 1935.

The following are the only specimens of *C. granitophilus* found among 600 sheets of *C. aristatus* (i. e., *C. inflexus*):

ALABAMA: Randolph County, *McVaugh* 5213. GEORGIA: Columbia County, *McVaugh* 5144; *Pyron and Duncan* 86; De Kalb County, *Biltmore Herbarium* 5062b (cotype); *Correll* 8380; *Pollard and Maxon* 500; *Small* in 1894, Greene County, *McVaugh* 5326; Hancock County, *McVaugh* 5362; Heard County, *McVaugh* 5181; Oglethorpe County, *McVaugh* 5370; Walton County, *Pyron and McVaugh* 971 (type). NORTH CAROLINA: Henderson County, *McVaugh* 5410; Forsyth County, *Wherry and Pennell* 14335; Rowan County, *Biltmore Herbarium* 5062a; Franklin County, *H. J. Oosting* 1824. SOUTH CAROLINA: Kershaw County, *McVaugh* 5129.

All these specimens were collected on certain granitic outcrops in the above-mentioned counties although specimens collected on other granitic outcrops were *C. aristatus*. Apparently, the species is confined to primary soils resulting from the decomposition of granite. In fact, angular fragments of quartz and black plates of biotite are intermixed with the roots of the isotype specimen (*Pyron and McVaugh* 971).

According to T. H. Watson (Bull. Geol. Sur. Ga. 9-A, 60-65, 1902 and U. S. Geol. Surv., Granites of the Southeastern Atlantic States 426: 233. 1910) "the light gray granite of Stone Mountain is strongly contrasted with all other types of granite in Georgia. It differs from them in mineral composition in the large preponderance of muscovite over biotite, which though invariably present, occurs in very small quantity." This difference in mineral composition does not obviously explain why the species seems to be confined to this type of granite. Perhaps the presence of accessory apatite is more significant. All the Georgia granites contain plagioclase in considerable amounts, so that the concurrence of large amounts of calcium and potassium in the resultant soil cannot be used to explain the range of *C. granitophilus*.

The best position for *C. granitophilus*, *C. hamulosus* and *C. aristatus* (including *C. inflexus*) appears to be in *Eucyperus*. In *C. granitophilus* the glumes are decidedly more readily deciduous than the rhachilla; in *C. aristatus* (from North America) the glumes are very nearly as readily deciduous. This is also the case with twenty sheets of *C. aristatus* from the Old World (e. g. *Kotschy* 50, Nubia, in the Gray Herbarium with no rhachillas shed and about fifty glumes gone) and specimens of *C. hamulosus*

(e. g., Herbarium De Candolle 129). This latter species is quite exceptional in the genus in that the glumes are not strictly 2-ranked. This arrangement and the constantly 5-nerved glumes are the only distinctions between it and *C. aristatus*. *C. aristatus*, *C. granitophilus* and *C. hamulosus* all have a solitary stamen (rarely 2), an annual habit, an identical peculiar odor, oblong anthers, and very prominent venation of the glumes. In striking contrast all the *Marisci* in the United States (and nearly all those of the rest of the world) have 3 stamens, are perennials, have no such odor, have linear anthers and glumes with relatively weaker venation. Clearly the *Aristati* do not belong in *Mariscus*. Not only the superficial resemblances of *Aristati* place them, as pointed out by Kükenthal (Engler, Das Pflanzenreich 42²⁰: 505. Note 1936) with the section *Amabiles* in *Eucyperus*, but in my opinion also their fundamental characters (Kükenthal takes the opposite view with respect to these last). However, section *Amabiles* (and section *Compressi*), although resembling the *Aristati*, differ from the latter in having the rhachillas very long-persistent and obscurely, if at all, jointed to the rhachis.

Further, the relatively deciduous character of rhachilla and glumes or the persistence and non-persistence of bracteole and prophyllum (often called lower scales) is quite unreliable as a means of determining the relationship of species of *Cyperus*. Equally unreliable as a criterion for the separation of the subgenera *Eucyperus* and *Mariscus* is the method of disjoining glumes and rhachillas, i. e., whether the disarticulation is along a straight or a jagged line. In proof of this the following may be cited:

In *C. compressus* the rhachillas appear to be not at all jointed to the rhachis and only after all the glumes have fallen do they disarticulate along a jagged line above the base. The bracteole and prophyllum are more or less readily deciduous. *C. cuspidatus* behaves similarly.

In *C. erythrorhizos* the rhachillas disarticulate nearly as readily as the glumes leaving a knob persistent on the rhachis exactly as in *Mariscus*. Again, the prophyllum and bracteole behave as in *C. compressus*.

In *C. rotundus* the glumes are very long-persistent; in fact, the author was unable to find any herbarium sheets where rhachillas, bracteole or glumes had fallen naturally.

C. esculentus has long-awned bracteoles subtending at least the lower spikelets similar to those in *C. flavus*. These as well as the glumes are very long-persistent. Only a few herbarium specimens showed rachillas deciduous and none at all showed glumes deciduous. Where the rachillas have fallen the bracteoles are usually persistent and there is usually a disc or knob with a smooth scar exactly similar to that shown in the *Marisci*.

In *C. Iria* the glumes are readily deciduous along a straight line while the rachillas are long-persistent but finally deciduous leaving a smooth or rough-edged scar above the persistent bracteole and prophyllum.

In *C. pseudovegetus* the glumes are readily deciduous along a straight line; the rachillas as well as bracteoles are long persistent.

All the foregoing species are universally considered members of *Eucyperus* and yet, their characteristics are frequently those assigned to *Mariscus*. On the other hand, in *C. filiculmis* (placed by Kükenthal in *Mariscus*) the glumes soon disjoint along a straight line; the rachillas disarticulate with about the same ease and at about the same age as the glumes leaving a smooth disc-like scar but without persistent bracteoles and prophylla. In a specimen of *C. strigosus* (*J. B. S. Norton* 1116, Maryland), the majority of the rachillas have fallen, but a considerable portion, perhaps 10%, of the rachillas are still persistent and most of the glumes have fallen from these persistent rachillas. By contrast, in another specimen of *C. strigosus* (*J. B. S. Norton* 1117, Maryland) about half the spikelets have fallen but no glumes have fallen from any of the spikelets that still persist on the rachis. Even the fallen spikelets still retain all the glumes! In *John M. Fogg* 3251 from Barnstable Co., Mass. and *True* 2862 from Morris Co., N. J., both *C. strigosus*, most of the rachillas are persistent while nearly all the glumes have fallen!

C. planifolius L. C. Rich. (= *C. Ottonis* Boeck. = *C. brunneus* Sw.), commonly accepted as one of the *Marisci*, always has rachillas persisting long after the glumes have fallen!

C. aristatus, *C. granitophilus*, and *C. hamulosus* show glumes that are deciduous before the rachilla (e. g., *Palmer* 417, from San Pedro Martin Island, Gulf of California, and *Torrey's* specimen from Yosemite Valley, California, Aug. and Sept. 1872,

both in the herbarium of the Acad. Nat. Sci. Phila., show numerous persistent rhachillas from which the glumes have fallen) but the rhachillas themselves are also readily deciduous (naturally or artificially), leaving a smooth knob persistent on the rhachis, while the bracteoles and prophylla behave as in *C. compressus*.

It seems, therefore, that the weightier and more decisive reasons place *C. aristatus* and its allies in *Eucyperus* as a section but neither in sections *Amabiles* nor *Compressi*.

STATUS OF *CYPERUS INFLEXUS* MUHL.

This species was described by Muhlenberg [Descr. 1817] in terms that do not distinguish it in any particular from *Cyperus aristatus*. He does say "C. squarroso et aristato affinis and C. conferto proximus, Swartz 5." In Muhlenberg's collection at the Philadelphia Academy of Science, folder #44 contains his collection of *Cyperus* (sheets #26 to #49 inclusive). Sheet #27 (collector's #5) is labelled "C. suaveolens compresso prox." without any mention of *C. inflexus* anywhere on the sheet or on the folder. In addition to some ten plants of what has been passing as *C. inflexus* Muhl. there are two dwarf specimens of *C. erythrorhizos* Muhl. Sheet #34 of this same folio (collector's numbers 452 and 474) is *C. erythrorhizos* and was so named by the author. It certainly seems curious that he used his name for *C. erythrorhizos*, but never used *C. inflexus*. This may indicate Muhlenberg himself had misgivings about his *C. inflexus*. The ten plants of *C. aristatus* in Muhlenberg's collection have culms 5-7 cm. tall, spikelets 8-10 mm. long, the body of the glumes 1-1.2 mm. long, almost always 9-nerved. On one mature head 5 or 6 basal glumes are missing on each of the rhachillas which were all still persistent on the rhachis. Many of the pale immature achenes and solitary stamens are persistent on the rhachilla although the glumes have fallen. About 20 to 30 spikelets form a head. The achenes are obovoid-oblong, none of them mature. Although these specimens are a century old, they are still distinctly aromatic. This plant is exactly the same as material collected in Virginia and Pennsylvania today.

This plant has been treated as synonymous with *Cyperus aristatus* Rottb. by Robinson & Fernald [Gray, Man. ed. 7, 175 (1908)] and by Britton [Bull. Torr. Club 13: 207 (1886)] but by Boeckeler

[Linnaea **35**: 500 (1868)] as a form of *C. aristatus*. Later Britton considered it a distinct species [Ill. Fl. N. E. States **1**: 300, ed. 2 (1913) and Abrams' Ill. Fl. Pacific States **1**: 227 (1933)]. Kükenthal [Pflanzenreich **4**²⁰: 504 (1936)] treated it as a variety of *Cyperus aristatus*. Apparently, Britton nowhere published the means he used to distinguish *C. aristatus* from *C. inflexus*, whereas Kükenthal gives differences which may be summed up in the following table and key:

| | Height of plant | No. of rays | Diam. of spikes | Color of glumes | Size of achene |
|----------------------|---------------------|-------------|-----------------|---|-------------------------------------|
| <i>C. aristatus</i> | 2-20 cm. | 2-5 | 8-10 | "rufae vel ferrugineae vel stramineae" "saepius pallescentes" | $\frac{1}{3}$ - $\frac{1}{2}$ glume |
| var. <i>inflexus</i> | "plerumque humilis" | 1-3 | 4-6 | | $\frac{1}{2}$ - $\frac{2}{3}$ glume |

KEY BASED ON THE ABOVE CHARACTERS

Spikes 8-10 mm. diam. achene $\frac{1}{3}$ - $\frac{1}{2}$ length of glume; glumes brown, red or yellow; plant 2-20 cm. tall; rays 2-5. *C. aristatus* Rottb.
 Spikes 4-6 mm. diam. achene $\frac{1}{2}$ - $\frac{2}{3}$ glume; glumes often pale in color; plant very low; rays 1-3. var. *inflexus* (Muhl.) Kükenth.

With all authors *C. inflexus* is considered to be confined to the American continent. On the other hand, *C. aristatus* is found in the Old World and according to Kükenthal in Yucatan in the New World.

The following table shows measurements, etc. of important features that have been used to differentiate *C. inflexus* from *C. aristatus*:

| | Height of culm (cm.) | No. of rays | Diam. of spikes (cm.) | Color of glumes | Length of body of glume (mm.) | Length of mucro (mm.) | Length of entire glume (mm.) |
|---------------------------------------|----------------------|-------------|-----------------------|--------------------|-------------------------------|-----------------------|------------------------------|
| Stewart 9464, Kashmir, N. W. Himalaya | 2.5-3.0 | 0-2 | 0.5-1.2 | straw-colored | 1.5 | 0.5-0.7 | 2.0-2.2 |
| Koelz 3064, Punjab | 1.5-2.0 | 0-1 | 0.8-1.0 | pale straw-colored | 1.5 | 0.5-1.0 | 2.0-2.5 |
| Wight 1819, India | 3.0-5.0 | 0-4 | 0.5 | brown | 1.0 | 0.5-1.0 | 1.5 |
| Delavay 1760, China | 2.0-2.5 | 0-4 | 0.4-0.8 | brown | 1.2-1.5 | 0.5-0.8 | 2.0 |

| | Height of culm (cm.) | No. of rays | Diam. of spikes (cm.) | Color of glumes | Length of body of glume (mm.) | Length of mucro (mm.) | Length of entire glume (mm.) |
|---|-------------------------------|-------------------|---|---|---|--------------------------------|--|
| Curtis 536, British East Africa | 5-10 | 3-4 | 0.5-0.9 | straw- colored and red- dish brown on the same culm | 1.0-1.3 | 0.8-1.0 | 1.8-2.0 |
| Leprieur, Senegal, Africa, in 1924 | 6.5-10 | 3-4 | 0.6-1.0 | reddish- brown | 1.0-1.5 | 0.6-1.0 | 1.5-2.0 |
| Schlagintweit 6136, Tibet | 2.5-5 | 2-4 | 0.3-0.4 | straw- colored | 1.2-1.5 | 0.5-1.0 | 2.0-2.5 |
| Schlagintweit 3626 Tsamba, Western Himalaya | 3.5-6 | 5 | 0.3-0.8 | straw- colored | 1.5-2.0 | 0.5-1.0 | 2.0-3.0 |
| T. Thompson, N. W. Himalaya | 1.5-6 | 3-4 | 0.7-0.8 | straw- colored | 1.5-1.8 | 0.5-1.0 | 2.5-2.8 |
| J. D. Hooker, East India | 0.7-2 | 3 | 0.5-0.7 | reddish- brown | 1.2-1.5 | 0.5-1.0 | 1.8-2.0 |
| Kotschy 50, Nubia, Africa | 5.0-11 | 4-6 | 0.6-1.0 | light brown | 1.0-1.5 | 0.8 | 1.5-2.0 |
| Roper, Senegal, Africa | 8.0-13 | 3 | 0.5-0.6 | brown | 1.0-1.2 | 0.8-1.0 | 1.5-2.0 |
| *Koeltz 3593, Kashmir, N. W. Himalaya | 0.5-1.0 | 0 | Only 1 spikelet at the summit of culm, 2.5-3.0 mm. wide | pale straw- colored | 1.5-2.0 | 0.5-1.0 | 2.0-3.0 |
| *G. King 1869, Dehra Dun | 1.0-3.5 | 0 | Only 1-2 spikelets at the summit of culm, 1.5 mm. wide | reddish or purplish brown | 1.0-1.5 | 1.0 | 1.5-2.0 |
| **Lawrence, India | 2.0-5.0 | 0 | 0.8-1.2 | reddish- brown | 2.0-2.5 | 1.0-2.0 | 4.0-4.5 |
| **Ward, India | 1.5 | 0 | 0.8 | reddish- brown | 1.2-1.5 | 1.2-1.5 | 2.5-3.0 |
| **Wight, 1820, India (type or isotype) | 3-4 | 0 | 1-1.5 | reddish- brown | 1.8-2.0 | 1.5-2.0 | 3.2-3.5 |
| **Wallich 3374, ex herb. Wight (cotype) | 3.0 | 0 | 0.9 | reddish- brown | 1.5 | 1.0-1.5 | 2.5-3.0 |
| <i>Plantae Exsiccatae Grayanae</i> 130 | 1-2 | 0-3 | 0.7-0.8 | reddish- brown | 1.4-1.6 | 1.0-1.2 | 2.2-2.5 |
| Hapeman, Aug. 3, 1920, Minden, Nebraska | 5-10 | 0-5 | 0.7-1.3 | straw- colored | 1.5-1.8 | 1.0-1.5 | 2.5-3.0 |

* *C. aristatus f. alpinus* C. B. Clarke** *C. aristatus* var. *versicolor* (Nees) Kükenth.

| | Height of culm (cm.) | No. of rays | Diam. of spikes (cm.) | Color of glumes | Length of body of glume (mm.) | Length of mucro (mm.) | Length of entire glume (mm.) |
|---|-------------------------------|-------------------|--------------------------------|-----------------------|---|--------------------------------|--|
| Gaumer 1023, Yucatan | 7-12 | 0-5 | 1.0-2.0 | dark brown | 1.5-2.0 | 1.0-1.5 | 2.5-3.0 |
| De Wailly 4686, Africa | 4-7.5 | 0-4 | 0.5-0.9 | straw- colored | 1.2-1.3 | 1.0 | 2.0-2.2 |
| Rottboell's type speci- men (photograph) | 5.5-7.5 | 0-3 | 0.3-0.5 | | 0.8 | 0.5-1.0 | 1.3-1.5 |

From the above table it is evident that:

(1) The distinction as to height of culm cannot be used to separate Old World from New World material. *Tweedy* 4859, Colorado, has culms 1.5-5.0 cm. tall; *Copeland* 612, California, has culms 0.5-1.0 cm. tall bearing 1 or 2 spikelets. These are very much like C. B. Clarke's forma *alpinus*. Considered by themselves they seem very distinct, but studied in connection with 600 sheets it is readily seen that they are merely depauperate forms connected by a large number of intergrading plants from every part of the United States.

(2) Number of rays is equally useless as a distinction, e. g., *Bartlett* 966, Georgia, has 1-5 rays; *Hapeman*, Nebraska, 1-5 rays, etc.

(3) Although Kükenthal gives spikes 8-10 mm. in diameter for *C. aristatus* and 4-6 mm. for *C. inflexus*, specimens from the southern states, Georgia to California, frequently show spikes 15-30 mm. across, while Old World specimens often have spikes 4-6 mm. in diameter.

(4) As to the color being rufous or ferruginous, this color is about equally common in both Old and New World specimens, and, apparently, is the result of the kind and amount of sunlight which the plant receives. (*Curtis* 536, British East Africa, shows glumes straw-colored and reddish-brown on the same culm.)

(5) As regards the length of glume contrasted with length of achene, the ratio is found to be about the same in both Old and New World material, thus in Old World specimens it varies from 1.9-3.6 and in those from the New World 2.2-3.6. *McVaugh* 4497, Columbiaville, N. Y., has achenes nearly or quite as long as the body of the glume, although some of the achenes are only $\frac{2}{3}$ as long as the body of the glume. On the other hand, Sheldon's

specimen from Minnesota, Chapman's from Florida and Hale's from Louisiana show achenes $\frac{1}{2}$ to $\frac{1}{3}$ as long as the glume. *J. & T. Howell*, Oregon, Columbia River, shows achenes $\frac{1}{3}$ to $\frac{2}{3}$ as long as the glumes. *Reverchon* 3591, Texas, has achenes $\frac{1}{2}$ as long. From these specimens selected at random from widely scattered points in the United States as well as from the table, it is quite evident that distinctions based on relative length of achene and length of glume show as wide a variation in American as in Oriental material.

From these facts it seems evident that there is no distinction at all between *C. inflexus* and *C. aristatus* and that it is, apparently, something of a weed in tropical and warm-temperate regions everywhere.

C. versicolor Nees, based on *Wight* 1820, Madras, India, has been reduced by Boeckeler to a variety of *C. aristatus*. This variety is clearly separable by means of the characters listed by Kükenthal (*Das Pflanzenreich* 420²: 504. 1936).

Apparently, Kükenthal very rightly reduced *C. falciculosus* Liebm. to a form of *C. aristatus*. *Purpus* 6345 seems best treated as this form.

In 1899, F. Cavara published *C. aristatus* var. *Boeckeleri* [*Atti Ist. Bot. Univ. Pavia* 5²: 23–28 (1899)] which Kükenthal puts in the synonymy under *C. aristatus* var. *inflexus* [*Pflanzenreich* 420²: 502. (1936)]. The accurately drawn plate showing life-size drawings of four different plants which Cavara comprises within his new variety can all be readily matched by plants from the United States or the Orient. Cavara gives as segregating characters:

Ochreis purpureo-violaceis, squamis subdecurrentibus, caryopside squamae medium superante, mellea, sub-translucida, stilo exserto, racheola anguloso-contorta.—Omnino gracilior.

Two pages previous to this, Cavara quotes a letter from Boeckeler regarding the variety he had named in his honor:

. . . Ich habe unsere Pflanze mit einem grossen aus verschiedenen Gegenden und Localitäten stammenden Material des *Cyp. aristatus* vergleichen können, und dabei die ausgezeichnete Beschaffenheit namentlich der Blätter u. Bracteen immer völlig constant gefunden. Gleichvoll kann ich sie nur für eine sehr ausgezeichnete Varietät des *Cyperus* nehmen.

Curiously, Boeckeler differentiates the variety on leaf and bract

characters, while Cavara refers to other and entirely different ones. Taking the characters proposed by the latter one by one: "ochreis purpureo violaceis" are colors frequently shown on material from any part of the world; "squamis decurrentibus" is hardly accurate, because the glumes are not prolonged and decurrent. Morphologically, the edge of the rhachilla is produced as a cartilaginous margin, not at all continuous with the base of the glume; the other characters he mentions, such as the length and color of the achene, are likewise shown by specimens selected at random from any part of the United States. The rhachillas in this species are all more or less zig-zag. Cavara, further, states that *C. aristatus* is a plant of the tropical regions, saying that it extends to Cuba and Mexico (Orizaba), oblivious to the fact that the same plant found at Orizaba extends as far north as New Brunswick and Vancouver Island. Boeckeler's differentiation is of even less value than Cavara's.

It seems best, therefore, to treat our American material as *C. aristatus* with the following synonymy:

C. ARISTATUS Rottb. Descr. et Icon. 23, t. 6, fig. 1. 1773. *C. uncinatus* R. Br. Prodr. 215. 1810; non Poir. *C. Brownei* R. & S. Syst. 2: 228. 1817. *C. inflexus* Muhl. Descr. 16. 1817. *C. Purshii* R. & S. Syst. 2: 177. 1817. *C. pygmaeus* Nutt. Trans. Am. Phil. Soc. 5: 142. 1837; non Rottb. *C. falciculosus* Liebm. Vidensk. Selsk. Skr. 5²: 204. 1851. *C. aristatus* forma *inflexus* Boeckl. Linnaea 35: 500. 1868. *C. aristatus* var. *Boeckeleri* Cavara, Atti Ist. Bot. Univ. Pavia 5²: 26. 1899. *C. aristatus* var. *inflexus* Küenth. in Engler, Das Pflanzenreich 4²⁰²: 504. 1936. *C. aristatus* var. *inflexus* f. *falciculosus* Küenth. in Engler, Das Pflanzenreich 4²⁰²: 505. 1936. *Chlorocyperus inflexus* Palla in allg. Bot. Zeitschr. 17. Beih. 6. 1911. *Dichostylis aristata* Palla in Engler, Bot. Jahrb. 10: 286. 1888. *Isolepis echinulata* Kunth, Enum. Pl. 2: 205. 1837. *Scirpus intricatus* L. Mant. 2: 182. 1771. *S. lappaceus* Lam. Ill. 1: 139. 1791 (ex descriptione).

In treating *C. aristatus* the following additional variety is to be noted:

C. ARISTATUS Rottb. **Runyoni** O'Neill, var. nov. Achenium lineari-spatulatum, 0.2 mm. latum, apice autem abrupte turgidum quasi-umbonatum 0.3 mm. latum; planta robusta. Caeterum sicut species.

This variety differs from the species in the shape of the achene which is linear-spatulate, 0.2 mm. wide throughout except at the abruptly widened, sub-umbonate apex which is 0.3 mm. wide.

The variety is a very robust plant as can be seen from the following description:

Leaves 1.5–2.0 mm. wide; bracts 1–5 mm. wide; rays 0–3, 0–4 cm. long, the peduncles 0–3 cm. long; spikelets 5–15 mm. long, 1.5 mm. wide, narrowly linear, 15–25-flowered; rhachilla 0.5 mm. wide, 0.2 mm. thick; glumes 2.2–2.8 mm. long, of which the awn is 1.0 mm., the body 1.3–1.8 mm. long, 0.6–0.7 mm. wide, oblong-lanceolate, scarcely, if at all, imbricate; achene 0.8–1.0 mm. long, 0.2 mm. wide throughout except at the abruptly widened, triumbonate, apiculate apex which is 0.3 mm. wide, linear-spatulate, grayish-brown (i. e., brown with a frost-like coat), iridescent, substipitate, minutely depressed-puncticulate.

TEXAS: Kenedy Co., *Runyon* #1933 (TYPE); *Runyon* 2655 Los Norias. *Buckley*, Valley of the Rio Grande, in 1879–1883 in New York Botanical Garden, but not *Buckley*'s specimen in the Philadelphia Academy of Science. MEXICO: State of Coahuila, Monclava, *Palmer* 1330. (U. S. Nat'l Herb.). Isotype specimens will be distributed to the Gray Herbarium, U. S. National Museum and forty other institutions.

CYPERUS BUSHII BRITTON

C. Bushii is here considered synonymous with *C. filiculmis*. Britton's type specimen, *Bush* 619 from Arkansas (in the New York Botanical Garden), agrees perfectly in all respects with specimens of typical *C. filiculmis* found in the Eastern States as already pointed out by Fernald & Griscom [*RHODORA* 37: 153: 1935]. A specimen of Commons collected at Rehoboth, Delaware, August, 1895, is a perfect match of the type. Furthermore, it was found that material from Pennsylvania, Maryland, Virginia and other eastern states could be readily duplicated by the western variants of the species.

A careful examination of other specimens in the New York Botanical Garden which Britton had annotated *C. Bushii* indicates that his idea of that species included the mid-western plant, \times *C. mesochorus* Geise (considered in this revision as a form of *C. Schweinitzii* with more densely congested spikes) and many western forms of typical *C. Schweinitzii* (e. g., the plant collected by Capt. Marcy in Oklahoma in 1852 which has rough culms, spikelets all ascending and glumes with conspicuous mucros, 0.3 to 0.5 mm. long).

It may be noted that western forms of *C. filiculmis* and *C. Schweinitzii* intergrade so closely that new names for these

intermediate plants accomplishes nothing except increased difficulty in setting limits to these two species. The following may be cited as examples of intermediate forms: *Rydberg* 2362 from Meadow Park, Colorado, which shows the inflorescence of *C. filiculmis* but the achenes and mucronate glumes of *C. Schweinitzii*, and *Gayle* 622, Ft. Riley, Kansas, which has the glumes of *C. filiculmis* but the inflorescence of *C. Schweinitzii*.

× CYPERUS MESOCHORUS GEISE AND *C. HOUGHTONII* VAR.
UBERIOR KÜKENTHAL.

× *C. mesochorus* is treated here as a form of *C. Schweinitzii* with denser heads containing more numerous and more digitately-disposed spikelets in contrast to the more pinnately-arranged spikelets found in typical plants. Although Sister M. Joseph Geise regarded it as a hybrid between *C. Schweinitzii* and *C. Houghtonii*, an examination of several hundred sheets of related species seems to indicate that the plant occupies an intermediate position not so much between *C. Houghtonii* and *C. Schweinitzii* as between *C. filiculmis* and *C. Schweinitzii*.

C. Houghtonii var. *uberior* is evidently identical with × *C. mesochorus*. As representative of his variety Kükenenthal cites the following: "Indiana: Dunes (U m b a c h !). Texas: Weatherford (T r a c y n. 7966!)." *Umbach* 1229, Dune Park, Indiana, was the only specimen seen among many collected by that botanist, which could be construed as var. *uberior* and in all probability is the specimen alluded to by Kükenenthal. It has been annotated by Sister Mary Joseph Geise as *C. mesochorus*. The specimen is very likely the isotype of Kükenenthal's variety and cotype of Geise's hybrid-species. Tracy's specimen matches in all details *Deam* 18168 and others from Indiana which have been annotated by Sister Mary Joseph Geise as × *C. mesochorus*.

CYPERUS SUBAMBIGUUS KÜKENTHAL.

Plants intermediate between typical *C. subambiguus* and typical *C. flavus* occur so very commonly, that the two species are considered synonymous in this study. Moreover, several sheets of *Blumer* 1636, from Arizona, isotypes of *C. subambiguus* var. *pallidicolor*, match a specimen of *C. flavus* from Uruguay collected by Arechavaleta as to size and shape of achene, length of

glumes and other characters. The only evident difference is the slightly less dense spikes in the Arizona specimens. *Yuncker* 5632 from Spanish Honduras seems intermediate between West Indian *C. flavus* and the Arizona material. *Ragonese* 184 from Argentine matches the Arizona specimens in every respect.

CYPERUS UNIFLORUS T. AND H. (= *C. SUBUNIFLORUS* BRITTON)

C. uniflorus and *C. strigosus* are sometimes confused. The following key serves to distinguish these species in the mature state:

- Glumes conspicuously clasping the achene, distant, *i. e.*, the apex of one glume barely reaching the base of the glume next above on the same side of the rhachilla, commonly reddish; the nerves aggregated close to the keel, spikelets subquad-rangular, 0.7 to 1 mm. wide, 1- to 5-flowered; rhachilla conspicuously curved about each achene, the wings 2 to 2.7 mm. long, 0.5 to 0.7 mm. wide, thickened over the angles of the achene; achene 2.2 to 2.5 mm. long, 0.6 to 1 mm. wide. *C. uniflorus*.
- Glumes spreading, imbricate, *i. e.*, the lower overlapping the next above on the same side of the rhachilla about half its length, commonly yellowish or golden brown; the nerves evenly distributed, spikelets compressed or subcompressed, 1 to 1.5 mm. wide, 4- to 20-flowered; rhachilla straight or slightly zigzag, the wings 1.5 to 2 mm. long, 0.3 to 0.5 mm. wide, thin, hyaline; achene 1.5 to 2 mm. (sometimes 2.2 mm. in var. *stenolepis*) long, 0.5 to 0.6 mm. wide. *C. strigosus*.

C. subuniflorus Britton is here included under *C. uniflorus* since it is impossible to draw any kind of a dividing line between the two entities when a large number of specimens are studied. Both species appear to stand at opposite ends of a long series of intergrading forms. The following specimens picked at random from several hundred sheets are such intermediate forms: *Reverchon* 999, *Hall* 686, *Clemens* 411, *Neally* 214, *Cory* 16517, *Purpus* 8294, *Ruth* 770 and 893, *Runyon* 1924 and 1932. Britton's species, published in *Small's Flora of the Southeastern United States* (ed I. 173. 1903), is based upon *C. uniformis* (obvious lapse for *uniflorus*) var. *pumilus* Britton, previously published as a *nomen nudum* (*Bull. Torr. Club* **13**: 215. 1886). *Palmer* 350 from Indian Territory and *Buckley's* specimen from the valley of the Lower Rio Grande (1879-1883) are respectively the type and cotype of that variety. Since Britton later raised that variety to specific rank as *C. subuniflorus*, these two specimens automatically become type and cotype of that species.

C. subuniflorus has been confused with *C. globulosus*. The differences are shown in the following key:

- Achene 0.6 to 1 mm. wide, 2 to 2.5 mm. long; wings of the rhachilla thickened over the angles of the achene; nerves of the glumes aggregated close to the keel; spikelets 1- to 5-flowered; leaves 1 to 2 mm. wide; bracts 3 to 5.....*C. subuniflorus*.
 Achene 0.5 to 0.6 mm. wide, 1.3 to 2 (usually 1.5) mm. long; wings of the rhachilla thin, hyaline; nerves of the glumes evenly distributed; spikelets 3- to 12- (rarely 25-) flowered; leaves 3 to 7 mm. wide; bracts 5 to 11.....*C. globulosus*.

Specimens cited by Kükenthal as *C. uniflorus* var. *floribundus* are examples of typical *C. uniflorus* with 1 to 3 extra achenes. The long recurved mucro mentioned as characteristic of this variety is found also on the type specimen of the species itself (*Drummond* 287 in the Torrey Herbarium of the New York Botanical Garden) in just as high a degree of development.

C. retroflexus as shown by the type specimen (*Buckley*, "northern Texas" in the Philadelphia Academy of Natural Sciences) is only a robust form of *C. uniflorus*. On the sheet in Britton's handwriting is "very large form or variety" (i. e., of *C. uniflorus*). Kükenthal reduces the plant to a variety of *C. uniflorus*, but since it has no characters which set it definitely apart from the species it is here placed in synonymy. The monographer mentions "spiculae demum reflexae teretes" as distinguishing feature. The spikelets on all *C. uniflorus* are more or less reflexed. Plank's specimens from Marfa and Burnett, Texas, *Sister M. Clare Metz* 294, *Reverchon* 3426 and Wright's plant from Texas all show reflexed spikelets in varying degrees. They are subquadrangular rather than terete. These same plants also show variable heights of culm, hence that feature must also be ruled out as a means of separating the variety from the species.

Of doubtful status is *C. uniflorus* var. *pseudothyrsiflorus* Kükenth. (= *Mariscus dissitiflorus* C. B. Clarke). Type specimen (*Pringle* 1966 from Nuevo Leon, Mexico) and closely similar Texan specimens, e. g., *Buckley's* from the Lower Rio Grande, *Tharp's* from Austin, *Cory* 15582 and 27390, *Hughes* 167 and Wright's, sine loc., all have 3 to 14 achenes in a spikelet. These plants may possibly be hybrids of *C. uniflorus* and *C. setigerus* T. et H.

CYPERUS FENDLERIANUS VAR. LEUCOLEPIS (BOECK.) KÜKENTH.

C. Fendlerianus var. *leucolepis* seems best regarded as synonymous with the species. The distinguishing varietal characters offered by Kükenthal are: "anthela unispicata 14 mm. longa oblonga-conica, spiculae parvae 3-4-florae patentissimae vel deflexae, squamae albescentes obsoletius nervosae purpureo-variegatae." One or more of these characters are not uncommon in typical specimens of *C. Fendlerianus*; plants with only 1 spike often have spikelets bearing 5 to 8 achenes, and plants with 3 or 4 spikes frequently show spikelets with 3 or 4 achenes. The color and nervation of glumes mentioned for the variety are the same as found in some otherwise typical specimens. Color of glumes is a variable, a superficial character not only in this species but throughout the genus. Certainly, it cannot be used to differentiate this variety.

The following table lists the features used by Kükenthal in setting apart his var. *major* from typical *C. Fendlerianus*:

| | Culms | Width of leaves | Diameter of Inflorescence | Spikes |
|---|--------------------------|--------------------|------------------------------|---|
| <i>C. Fendlerianus</i> var. <i>major</i> | "gracilis" "robustus" | 2-4 mm. "lata" | ————— "ad 4 cm." | "1 cm. longae" "longiores crassiores" |

Only three specimens of *C. Fendlerianus* among the many studied could possibly be considered the variety. Results of a careful examination of these plants particularly in regard to those characters mentioned above are tabulated:

| | Culms | Width of leaves | diameter of inflorescence | Spikes |
|---|--------------------------------|--------------------|------------------------------|-------------------------------------|
| Bros. Arsène & Benedict 16195 (cotype) | 1.5 mm. throughout | 2 to 3 mm. | 1.5-2.5 cm. | 1 cm. wide, 2 to 3.5 cm. long |
| Wynd & Mueller 580 | 1 mm. at apex 2 mm. at base | 3 mm. | 1.5-3 cm. | " |
| Shreve 9157 | 1 mm. at apex | 4 mm. | 2-4 cm. | " |

It is evident that the dimensions are such as to warrant placing the plants either with the species or the variety. The terminal spikes (20 to 35 mm. long) are somewhat longer than they are in typical specimens (10 to 20 mm.), but this character alone does not appear sufficient for maintaining the variety. Accordingly,

var. *major* is regarded in this study as merely a large form of the species.

C. sphaerolepis is placed by Kükenthal in the synonymy of *C. Fendlerianus* var. *debilis* yet the characters given by Boeckeler in his original description, namely, "umbel subtri-radiate; rays 0.6 to 1.8 cm. long; spikelets 2 to 6 mm. long, 4- to 8-flowered," are those of *C. Fendlerianus typicus* and not of var. *debilis*.

C. Rusbyi does not seem sufficiently distinct from *C. Fendlerianus*, since many intermediate plants are commonly found between the two species. In fact, such specimens as Standley's collection from the Organ Mountains, New Mexico (U. S. Nat. Herb. 560818), show what may be taken as the two species in the same tuft. It, therefore, seems best to retain this plant under the varietal name, *C. Fendlerianus* var. *debilis*. Although plants intermediate between the variety and the species itself are occasionally found, it is possible in most cases to separate the two.

CYPERUS PLANKII BRITTON

C. Plankii (= *C. ovularis* var. *robustus* Boeckl. and *C. retrorsus* var. *robustus* Kükenth.) is a robust plant of Texas and represents an extreme form of either *C. globulosus* or *C. retrorsus*. From a study of an excellent set of intergrading forms recently collected by Robert Runyon of Brownsville, Texas, it seems somewhat more appropriate to place it under *C. globulosus*. The number of florets in the spikelet, the color and texture of the glumes, in fact, the entire spikelet is precisely the same as in *C. globulosus*. The achene fluctuates in width between that of *C. globulosus* and *C. retrorsus*. Although the dense spikes, sometimes elongated, suggest the general appearance of *C. retrorsus*, a better series of connecting forms exists between *C. globulosus* and *C. Plankii* than between the latter and *C. retrorsus*. Fisher's specimen from Houston, Tharp's from Austin and Runyon's specimens 1926B, 2124 and 1926 show this clearly. The last specimen mentioned has 7- to 11-flowered spikelets exactly identical with typical *C. globulosus* spikelets.

C. globulosus and *C. retrorsus* themselves are very similar and intermediate forms between the two occur. The most satisfactory separation seems to be made according to the following key:

Mature spikelets 3- to 8-flowered, commonly yellowish, occasionally purplish brown; achenes commonly $2\frac{1}{2}$ times as long as wide.....*C. globulosus*.
 Mature spikelets 1- to 3-flowered, purplish brown; achenes 3 times as long as wide.....*C. retrorsus*.

It does not seem to mend matters by inserting a third ill-defined group (*C. Plankii*) between two already ill-defined and intergrading species. Accordingly, *C. Plankii* is here placed with *C. globulosus* and considered the form of that species in the xerophytic region of Texas.

C. globulosus var. *pseudofiliculis* is described by Kükenthal as: "Humilis 3-10 cm. altus. Spicae 1-4 saepe subsessiles agglomeratae vel laterales breviter pedunculatae." A specimen collected by Ruth in 1894 in Knoxville, Tennessee, and one collected by Davis in South Carolina were the only plants out of approximately 200 sheets of *C. globulosus* which could possibly be considered that variety. Ruth's specimen has mature plants with culms 5 to 8 cm. tall. Both specimens show 2 to 4 spikes but since specimens otherwise typical sometimes have 2 to 4 spikes, that feature cannot be considered diagnostic. Sessile spikes are not distinctive; they occur commonly in many tall specimens. In view of these facts, this variety is not maintained here.

In 1888 Britton published a variety *multiflorus* under *C. echinatus* (Ell.) Wood. In so doing, he transferred Chapman's unpublished variety of the same name from *C. Baldwinii* to *C. echinatus*. Kükenthal and Ekman, evidently, were not aware of Britton's variety, since they published a "new" variety *multiflorus* under *C. globulosus* Aubl. in 1929. Inasmuch as these plants, both Britton's and Kükenthal's, differ in no essential respect from typical *C. globulosus* except that the spikelets have 8 to 12 or rarely even as many as 25 achenes (in the typical material there are 3 to 8), they are included in the synonymy of the species.

CYPERUS NASHII BRITTON

C. Nashii, commonly considered a variety of *C. retrorsus*, seems best regarded as a distinct species on account of the differences shown in the following key:

Achene 3 to 4 times as long as wide, 1.5 mm. long, 0.4 to 0.5 mm. wide; glumes 2 to 2.5 mm. long, 1.2 to 1.5 mm. wide, conspicuously nerved, dull, the margins more or less involute, not meeting at the rhachilla.....*C. retrorsus*.

Achene 2 to 3 times as long as wide, 2 mm. long, 0.7 to 1 mm. wide; glumes 2.2 to 3 mm. long, 1.8 to 2 mm. wide, obsoletely nerved, lustrous, the margins tightly involute and frequently meeting or even overlapping at the rhachilla.....*C. Nashii*.

Below are some typical examples of *C. Nashii*:

TYPE SPECIMENS: *Nash* 1196, Eustis, Lake Co., FLORIDA, August 16-25, 1884, in the New York Botanical Garden. Photograph in the Langlois Herbarium. FLORIDA: *Britton* and *Wilson* 28; *Correll* 5846; *Correll* and *McFarlin* 6228; *Chapman*, *Apalachicola* in 1889; *Cuthbert*, Bradentown; 1613; *Hitchcock*, Eustis; *Nash* 1195, 1196 (type); *O'Neill* 5094, 5095, 7241, 7242, 7244; *Pieters* 45; *Small* and *DeWinkler* 9986; *Small*, *Small* and *DeWinkler* 10640; *Small* and *West*, Avon Park; *West*, Lake Worth, Palm Beach County; *West* and *Arnold*, Gilchrist County; *Tracy* 6316. GEORGIA: *Eyles* 6496.

(To be continued)

NOTES ON SOME FRESH-WATER ALGAE FROM NEW ENGLAND¹

A. H. GUSTAFSON

STUDIES on the New England fresh-water algae have extended over a considerable period of time, have been carried on by a large number of well-known algologists both native and foreign, and have been published in an extensive series of papers but our knowledge of even such problems as their occurrence and distribution is fragmentary. The first record of a specific alga together with its place of collection appears to be that of Eaton (6) in 1817. An appendix to Bailey contributed by Cole (3) lists certain species from Salem, Massachusetts and Olney (11) published early Rhode Island records. Since the middle of the last century more than 150 papers containing data on the New England fresh-water species have appeared. A list of the authors of these papers includes a large proportion of the better-known American students as well as a number of representative European scholars. Data on the Maine species has been supplied for the most part by Harvey (7, 8, 9) and West (15, 16) and is far from complete. New Hampshire has been a fertile collecting ground especially for students of the desmids and a considerable

¹ It is a pleasure to acknowledge financial assistance from the Williams College 1900 Fund in carrying on this study.

number of new species have been described from the state but the other algal groups are poorly known. The Vermont records are very scanty. The Reports of the Massachusetts Water Board especially in the decade from 1880–1890 were outstanding in many respects but their contribution to distributional and taxonomic problems left much to be desired. The presence of the Marine Biological Laboratory at Woods Hole, Massachusetts has done much to stimulate a study of the waters of that region. Miss Croasdale's (5) summary of the species known from the Woods Hole area is a valuable contribution to our knowledge of the Massachusetts algal flora but it deals with a limited area and in common with all the studies referred to above made no attempt to treat all the groups now generally regarded as algae. Bennett's (2) Rhode Island list while extensive is certainly not complete. The state-wide survey of Connecticut by Hylander (10) probably makes our knowledge of the Connecticut fresh-water algal flora more complete than that of any of the other New England states but as in the other studies not all algal groups were considered.

Collections made in various parts of New England have revealed the presence of a number of species which will assist in filling in some of the recognizable gaps in our knowledge. These are listed together with some notes on their distribution and occurrence. Several of the species have no doubt been found by previous investigators but no published records exist. Thirty-five species are recorded several of which are rare in the United States. Twenty-five appear to be new finds for New England. Four are first records from Maine; three have been added to the New Hampshire flora; 17 have not previously been recorded from Vermont; and the list known from Massachusetts has been increased by 27.

With the exception of the insertion of the *Cryptophyceae* the systematic treatment follows Smith (12).

MYXOPHYCEAE

GOMPHOSPHERIA LACUSTRIS Chodat. No previous report from New England. Found at Laurel Lake, Lee, Massachusetts; Kennebec River, Maine; Lake Ossipee and Lake Mascoma, New Hampshire; White River, Vermont and several Vermont lakes.

HETEROKONTAE

CENTRITRACTUS BELENOPHORUS Lemmerman. There appears to be no published report of its occurrence in the United States although Dr. James Lackey of the United States Public Health Service Laboratory in Cincinnati, Ohio has shown the author many specimens from the tributaries of the Ohio and it has also been found by the author in Michigan (in press). Found in Cole Pond, Williamstown, Massachusetts.

CHRYSTOPHYCEAE

CHRYSOPHAERELLA LONGISPINA Lauterborn. Known only three or four times from widely scattered regions in the United States but not from New England. Found in Sucker Pond, Stamford, Vermont.

DINOBYRON BAVARICUM Imhof. The only New England record is from Connecticut (1). Abundant in the plankton of Lake Raponda, Wilmington, Vermont and sparingly in Lake Sadawga, Whittingham, Vermont, as well as in a bog-pond in Jacksonsville, Vermont.

DINOBYRON DIVERGENS Imhof. Not known from New England. Abundant in the plankton of Laurel Lake, Lee, Massachusetts and Lake Garfield, Monterey, Massachusetts.

DINOBYRON SERTULARIA Ehrenberg. This is without question one of the commonest of the New England algae. Found as a very abundant plankton organism all through Maine, New Hampshire, Vermont and western Massachusetts. The only previous records are from Connecticut (4) and Massachusetts (3).

CHLOROPHYCEAE

VOLVOCALES

CHLAMYDOBOTRYS GRACILIS Korshik. There appears to be no certain published record of this species in the United States although Dr. James Lackey has shown the author many specimens from the tributaries of the Ohio River. Found in the summer of 1940 in the Androscoggin River at Lewiston, Maine in small numbers under interesting conditions. The odor of H_2S emanated from the Androscoggin to such an extent that it could be detected for some distance from the river and, naturally, caused considerable comment and concern in the vicinity. Samples from the surface waters at Lewiston revealed several species of blue-green algae which were not determined specifically. The lone species of green alga sparingly present although apparently in very good condition was the one under discussion. It showed very clearly in a number of slides made from the material. Interestingly enough chemical analyses of the water

made a few days before the samples were studied microscopically showed oxygen to be present only to the extent of half a part per million.

PHACOTUS LENTICULARIS (Ehrenberg) Stein. Found only three or four times in the United States but never from New England. Collected at Bridge's Pond and Cole Pond, Williamstown, Massachusetts as an occasional plankton type.

PLEODORINA CALIFORNICA Shaw. Not known from New England. Found in Cole Pond, Williamstown, Massachusetts and in Woodford Pond, Woodford, Vermont.

ULOTRICHALES

RADIOFILUM CONJUNCTIVUM Schmidle. Smith (12) states this species occurs infrequently in the United States and it has not been listed from New England. Collected several times in Bridge's Pond, Williamstown, Massachusetts and in Lake Raponda, Wilmington, Vermont as well as in roadside ditches in Pownal, Vermont.

CHLOROCOCCALES

GOLENKINIA PAUCISPINA W. and G. S. West. Not known from New England. Collected in the Connecticut River at Turner's Falls, Massachusetts; in Cole Pond, Williamstown, Massachusetts; and in the Connecticut River at Brattleboro, Vermont.

GOLENKINIA RADIATA Chodat. This common planktonic form has not been recorded from New England. Found in several lakes in western Massachusetts as well as in the Housatonic River at Great Barrington, Massachusetts; also, in the White River at White River Junction, Vermont and in Woodford Pond, Woodford, Vermont.

QUADRIGULA CHODATA (Tanner-Fullman) G. M. Smith. New to New England; Leake Pond, Williamstown, Massachusetts.

SCENEDESMUS ACUMINATUS (Lagerheim) Chodat. Known from Connecticut (10); Cole and Warren Ponds, Williamstown, Massachusetts.

TETRAEDRON HASTATUM (Rabenhorst) Hansgirg. New to New England; Cole Pond, Williamstown, Massachusetts.

TREUBARIA TRIAPPENDICULATA Bernard. New to New England; Warren Pond, Williamstown, Massachusetts and the Housatonic River, Great Barrington, Massachusetts.

ZYGNEMATALES

COSMARIUM DENTICULATUM Borge. New to New England; Gokey Pond, Kingston, Massachusetts.

COSMOCLADIUM SAXONICUM DeBary. This species not known from New England is rare in the United States. Found in Lake Onota, Pittsfield, Massachusetts and in a bog-pond in Jackson-ville, Vermont.

EUASTRUM GLAZIOVI Borgesen. Not known from New England; found in Lake Raponda, Wilmington, Vermont.

STAURASTRUM ARCTISCON (Ehrenberg) Lundell var. *GLABRUM* W. and G. S. West. Not known from New England; collected at Lake Onota, Pittsfield, Massachusetts, and in Lake Bomoseen, Vermont.

STAURASTRUM LACUSTRE G. M. Smith. Not known from New England; Lake Raponda, Wilmington, Vermont and Woodford Pond, Woodford, Vermont.

STAURASTRUM SETIGERUM Cleve. Known from Connecticut (10); Lake Pontoosuc, Pittsfield, Massachusetts.

TRIPLOCERAS GRACILE Bailey, var. *BIDENTATUM* Nordstedt. New to New England; Informe Pond, Hyannis, Massachusetts.

CRYPTOPHYCEAE

CRYPTOMONAS EROSA Ehrenberg. The genus has been listed for New England but the species has not been designated. Found at several ponds in Williamstown, Massachusetts.

CRYPTOMONAS OVATA Ehrenberg. Unger (14) lists for Maine. Found all through western Massachusetts, in several lakes in southern Vermont and central New Hampshire as well as in the Kennebec River, Maine.

DINOPHYCEAE

CERATUM HIRUNDELLA (O. F. Müller) Schrank. The genus has been reported frequently from New England but never with the specific designation although as a species frequently dominant in the plankton it must have been collected by almost every student of the algae. Frequent or abundant everywhere in collections from Maine, New Hampshire, Vermont, and Massachusetts.

EUGLENOPHYCEAE

EUGLENA OXYURIS Schmarda. Not reported from New England; Cole and Warren Ponds, Williamstown, Massachusetts.

EUGLENA SPIROGYRA Ehrenberg. Known from Maine (14), Connecticut (4), and Massachusetts (3); occasional specimen from roadside ditches in Woods Hole and Williamstown, Massachusetts and Pownal, Vermont.

PHACUS ACUMINATUS Stokes. Apparently not reported from New England although it is a common species; found at several stations in Massachusetts such as Woods Hole, Worcester, Shelburne Falls, and Williamstown.

PHACUS LONGICAUDA (Ehrenberg) Dujardin. No New England report since that of Cole (3). Found at Woods Hole and Williamstown, Massachusetts as well as from Pownal, Vermont.

LEPOCINCLIS OVUM (Ehrenberg) Lemmerman. The only previous New England record is from Maine (14). Found in the

plankton at Warren Pond, Williamstown, Massachusetts and the Housatonic River, Great Barrington, Massachusetts.

TRACHELOMONAS CREBEA Kellicott. First New England record seems to be from Cole Pond, Williamstown, Massachusetts.

TRACHELOMONAS HORRIDA Palmer. Listed by Unger (14) from Maine; found in Cole Pond, Williamstown, Massachusetts.

TRACHELOMONAS URCEOLATA Stokes. Unger (14) lists the variety *SERRATOGLABRA* from Maine but the species appears to be new to New England. Found in Warren Pond, Williamstown, Massachusetts.

TRACHELOMONAS VOLVOCINA Ehrenberg. Listed from Connecticut (4) and Maine (14); found in Lake Raponda, Wilmington, Vermont and in roadside ditches Pownal, Vermont, as well as abundantly throughout western Massachusetts.

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GRASSES OF HOT SPRINGS NATIONAL PARK, ARKANSAS, AND VICINITY

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Hot Springs National Park is particularly rich in the great variety of grasses to be found on its wooded slopes and in its moist valleys and occasional open fields. The following 64 grasses have been collected in the park and the immediate vicinity. A few are evident escapes from cultivation, but it is interesting to note their persistence and spread in competition with native grasses. Determinations have been verified by Dr. Jason R. Swallen of the United States Department of Agriculture. Two species, *Panicum Bicknellii* and *Paspalum laeve*, are reported as being the first specimens received from Arkansas.

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| Agrostis alba L. | Panicum Boscii, var. molle (Vasey) Hitchc. |
| Agrostis hiemalis (Walt.) B. S. P. | Panicum commutatum Schult. |
| Alopecurus carolinianus Walt. | Panicum huachucae, var. fasciculatum (Torr.) Hubb. |
| Andropogon scoparius Michx. | Panicum linearifolium Scribn. |
| Arundinaria tecta (Walt.) Muhl. | Panicum microcarpon Ell. |
| Avena sativa L. | Panicum polyanthes Schult. |
| Brachyelytrum erectum (Schreb.) Beauv. | Panicum scoparium Lam. |
| Bromus commutatus Schrad. | Panicum sphaerocarpon Ell. |
| Bromus japonicus Thunb. | Panicum virgatum L. |
| Bromus purgans L. | Panicum Wernerii Scribn. |
| Cinna arundinacea L. | Paspalum dilatatum Poir. |
| Cynodon dactylon (L.) Pers. | Paspalum floridanum Michx. |
| Dactylis glomerata L. | Paspalum laeve Michx. |
| Danthonia spicata (L.) Beauv. | Paspalum longipilum Nash. |
| Digitaria sanguinalis (L.) Scop. | Paspalum pubescens Muhl. |
| Echinochloa crusgalli (L.) Beauv. | Paspalum pubiflorum, var. glabrum Vasey. |
| Eleusine indica (L.) Gaertn. | Poa pratensis L. |
| Elymus riparius Wiegand. | Setaria lutescens (Weigel) Hubbard |
| Eragrostis cilianensis (All.) Link. | Setaria viridis (L.) Beauv. |
| Festuca octoflora Walt. | Sorghum halepense (L.) Pers. |
| Festuca Shortii Kunth. | Sorghum vulgare Pers. |
| Glyceria striata (Lam.) Hitchc. | Sphenopholis nitida (Spreng.) Scribn. |
| Hordeum jubatum L. | Sphenopholis obtusata (Michx.) Scribn. |
| Hordeum pusillum Nutt. | Sporobolus Poirerii (Roem. & Schult.) Hitchc. |
| Hordeum vulgare L. | Stipa avenacea L. |
| Hystrix patula Moench. | Triodia flava (L.) Smyth. |
| Lolium multiflorum Lam. | |
| Lolium perenne L. | |
| Melia mutica Walt. | |
| Miscanthus sinensis Anderss. | |
| Panicum anceps Michx. | |
| Panicum Bicknellii Nash. | |

Triodia stricta (Nutt.) Benth.
Tripsacum dactyloides L.
Triticum aestivum L.

Uniola latifolia Michx.
Uniola laxa (L.) B. S. P.
Uniola sessiliflora Poir.

HOT SPRINGS, ARKANSAS

CAREX Bayardi, nom. nov. *C. crus-corvi*, var. *virginiana* Fernald in RHODORA, xxxix. 393, pl. 476, figs. 1–5 (1937). *C. virginiana* (Fernald) Fernald, ibid. xliii. 542 (1941), not Woods¹ in Rees Cycl. vi. no. 100 (1819).

Again I have been caught by the joker in the International Rules of Botanical Nomenclature. *Carex virginiana* Woods was a substitute for the earlier *C. stricta* Lam., therefore, by the Rules, illegitimate; nevertheless, it has sufficient legitimacy, according to the Rules, to prevent the use of the name again. I am, accordingly, substituting a new name, from BAYARD LONG, who has helped collect practically all the numbers of this distinguished species.—M. L. FERNALD.

MACLOVIANA AS A SPECIFIC NAME.—One of the distinguished members of *Carex* § *Ovales* is *C. macloviana* D'Urville in Mém. Soc. Linn. Paris, iv. 559—reprinted as Flore des Iles Malouines, 28 (1826). *C. macloviana* is one of those vastly significant species which are now known only in scattered areas in the Northern Hemisphere (Greenland; Labrador; Gaspé Peninsula of Quebec; northwestern Canada, with several closely allied forms southward into the mountains of Colorado, Utah and California; Mt. Orizaba, Mexico; and Kamchatka and the Kurile Islands), with the remainder of the species confined to southern South America (Falkland Islands and Tierra del Fuego northward into southern Argentina and Chile). Reaching the Shickshock Mts. of Gaspé the species will find a place in the next edition of Gray's Manual. It has, therefore, become necessary to determine the correct orthography of its name. Some recent students of boreal floras (Ostenfeld in Flora Arctica, etc.; Porsild in his publications on Greenland) render it as *C. Macloviana*, thus suggesting that it is directly based upon a personal name. Others (Kükenthal and

¹ Acc. to *Index Kewensis*, although I find no statement of the authorship in Rees Cyclopaedia.

Mackenzie, for instance) follow the original author, D'Urville, in using a lower-case initial.

The species was described from the Falkland Islands, which were early visited by mariners from St. Malo. They, therefore, named the Islands les Iles Malouines; and in D'Urville's paper several species bear the specific name, with lower-case initial, *macloviana*, although the author regularly used capital initials for names directly derived from those of persons, *Epipactis Lessonii* for example. Although the Latin names of St. Malo and its derivative, Iles Malouines, do not appear in the few atlases, gazetteers and Latin dictionaries immediately at hand, the statement in *Encyclopaedia Britannica* is to the point:

In the 6th century the island on which St. Malo stands was the retreat of Abbot Aaron, who gave asylum in his monastery to Malo (Maclovius or Malovius), a Cambrian priest, who afterwards became bishop of Aleth (now St. Servan).

The specific epithet of *Carex macloviana* is, then, quite parallel with those of the combinations *Scirpus hudsonianus* and *Cerastium beeringianum*, an adjective derived from a geographic name, which originally repeated a personal name. As such it should have a lower-case initial. The wording of the recommendation (no. XLIII) in the International Rules is not wholly satisfactory. It reads:

XLIII. Specific (or other) epithets should be written with a small initial letter, except those which are derived from names of persons (substantives or adjectives) or are taken from generic names (substantives or adjectives).

To these were added in 1935 vernacular names, which are capitalized. The recommendation would better reflect good usage if it said "except those which are derived *directly* from names of persons," for the distinction should be clearly made between names intended to honor persons (*Habenaria Hookeriana*, *Malva Tournefortiana*, etc.) and those based upon geographic areas which were named for persons (*Prunus virginiana*, *Rhexia mariana*, *Claytonia caroliniana*, *Carex macloviana*, etc.).—M. L. FERNALD.

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